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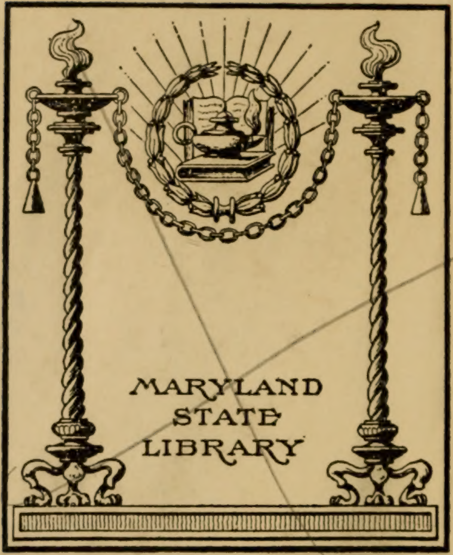

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ORDINANCE No. 578

ORDINANCES AND RESOLUTIONS

OF THE

MAYOR AND CITY COUNCIL

OF BALTIMORE

PASSED AT THE ANNUAL SESSION 1941-1942

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ORDINANCE

No................

(Introduced March 11, 1941, by the President.)

(Referred to the Committees on Building and Building Regulations and Legislation.)

An ordinance to repeal Article 3 of the Baltimore City Code (1927 Edition), title "Buildings", and all amendments thereto, together with all rules and regulations which have been promulgated or adopted, or which have been confirmed or continued in effect, in accordance with the provisions of any section of said Article 3, and to repeal Sections 125 to 128, both inclusive, of Article 32, title "Police", sub-title "Quarries", of the Baltimore City Code (1927 Edition), and all amendments thereto, and to repeal Ordinance No. 795, approved October 3, 1938, regulating the use of lots for parking or storage of motor vehicles, and all amendments thereto; and to ordain in lieu of the said Article, rules, regulations, Sections and Ordinance, and all amendments thereto, so repealed, a new Article, to be known as Article 3, title "Buildings, Structures and Operations on Land", relating to buildings, structures and operations on land and including provisions for: the reorganization of the Bureau of Buildings; the administration and enforcement of the provisions of this ordinance; the imposition of certain duties and the conferring of certain powers upon the Buildings Engineer and other officials of the Mayor and City Council of Baltimore; the establishment of principles, standards, provisions and requirements for the regulation of materials for, and the location, design, height, volume, area, size, construction, reconstruction, conversion, erection, installation, alteration, repair, maintenance, operation, inspection, testing, protection, razing, demolition, moving, removing, classification, arrangement, use, occupancy, paving, grading, filling, excavation of, and other operations or work in, on, upon or in connection with, buildings, structures, land, machinery, mechanical, electrical and other equipment, and other objects or things, new or existing, together with additions or accessories thereto, and equipment and appliances therefor, thereon and therein, in whole or in part,

202094

with certain exceptions; the payment and collection of certain fees and charges; the division of the City of Baltimore into certain fire zones; the numbering of buildings and other structures; penalties for violations of the provisions of this ordinance, and hearings and appeals.

WHEREAS, the Building Code of Baltimore is obsolete and in need of revision; and

WHEREAS, a Committee for the Revision of the Baltimore City Building Code was duly appointed; and

WHEREAS, said Committee has reported in favor of a revision and recodification of the Building Code of Baltimore; and

WHEREAS, it is desired to approve the revision and recodification recommended by said Committee with amendments and to ordain the same into law.

SECTION 1. *Be it ordained by the Mayor and City Council of Baltimore,* That Article 3 of the Baltimore City Code (1927 Edition), title "Buildings", and all amendments thereto, together with all rules and regulations which have been promulgated or adopted, or which have been confirmed or continued in effect, in accordance with the provisions of any section of said Article 3; and Sections 125 to 128, both inclusive, of Article 32, title "Police", sub-title "Quarries", of the Baltimore City Code (1927 Edition), and all amendments thereto, and Ordinance No. 795, approved October 3, 1938, and all amendments thereto, be and the same are hereby repealed.

SECTION 2. *And be it further ordained,* That in lieu of the Article, rules, regulations, Sections and Ordinance repealed in Section 1 of this ordinance, a new Article 3, title "Buildings Structures and Operations on Land," be it and it is hereby ordained to read as follows:

PART I

ADMINISTRATION

Chap. 10—General Building Code Regulations.
Chap. 11—Organization.
Chap. 12—Buildings Engineer.
Chap. 13—Applications for Permits.
Chap. 14—Permits.
Chap. 15—Certificates.
Chap. 16—Inspections and Tests.
Chap. 17—Fees and Service Charges.
Chap. 18—Routine and Procedure.
Chap. 19—Enforcement.

CHAPTER 10

GENERAL BUILDING CODE REGULATIONS

Sec. 100—Building Regulations.
Sec. 101—Purposes of Building Code.
Sec. 102—Scope of Building Code.
Sec. 103—Administration of Building Code.
Sec. 108—Enforcement of Building Code.
Sec. 109—Lands and Structures Not Subject to this Code.

SECTION 100

BUILDING REGULATIONS

Title of Building Regulations

Par. 1000. The provisions of this Article shall constitute and shall hereafter be known as "The Building Code of Baltimore City" and may be cited as the "Building Code." It shall hereinafter be referred to as this Code.

SECTION 101

PURPOSES OF BUILDING CODE

General Purpose of Building Code

Par. 1010. The purpose of this Code is to establish standards and to make provisions and requirements regulating the design, construction, reconstruction, installation, alteration, repair, razing, demolition, moving or removing of buildings and other structures, or parts thereof, or additions or accessories thereto, or equipment therein, including methods of construction, reconstruction, installation, alteration, repair, razing, demolition, moving or removing, and the sufficiency of materials used in connection therewith, and also regulating the grading of and excavation of land and other changes in land or parts thereof, and also regulating the maintenance, operation, use and occupancy of all buildings and other structures and land, and all inspections thereof, and also regulating the height, area and bulk of all buildings and other structures and the density of population for the purpose of protecting the public health, safety and security of the people of the City of Baltimore.

Building Code to be Remedial

Par. 1011. This Code is hereby declared to be remedial and shall be liberally construed to secure the beneficial purposes intended hereby.

SECTION 102

SCOPE OF BUILDING CODE

General Scope of Building Code

Par. 1020. The provisions of this Code shall apply to and presumptively provide for all matters relating to land, its topographical and physical condition, and the grading and excavating thereof; the location, design, construction, reconstruction, installation, alteration, repair, razing, demolition, moving or removing of buildings and other structures or parts thereof, or additions or accessories thereto, or equipment therein, in whole or in part; the location, design, construction, reconstruction, alteration, repair, removal and installation of all electrical appliances and equipment of all current capacities, voltages and frequencies, new or existing; the location, design, construction, reconstruction, alteration, repair, removal and installation of all elevator or other hoisting mechanisms, all machinery, boilers, heating plants, steam engines, refrigerating systems, tanks, fire prevention or fire protection systems, and all other mechanical equipment of whatsoever kind or character; the location, design, construction, reconstruction, alteration, repair, removal and installation of all gas appliances of every kind or character, and the application of the provisions of this Code shall include the methods of work and sufficiency of materials used in connection therewith.

The provisions of this Code shall also apply to and presumptively provide for all matters relating to the maintenance and operation of all land, buildings and other structures or parts thereof, or additions or accessories thereto, or equipment therein; the location and use and occupancy of all land, buildings and other structures, or parts thereof, or additions or accessories thereto, or equipment therein; the height, number of stories, size and bulk of all buildings and other structures, or parts thereof, or additions or accessories thereto, or equipment therein, and the density of population.

SECTION 103

ADMINISTRATION OF BUILDING CODE

Administration by Buildings Engineer

Par. 1030. This Code shall be administered by the Buildings Engineer as head of the Bureau of Buildings.

SECTION 108

ENFORCEMENT OF BUILDING CODE

General Enforcement of Building Code

Par. 1080. This Code shall be administered, enforced, and complied with in every particular, as prescribed, and in the manner herein set forth.

SECTION 109

LANDS AND STRUCTURES NOT SUBJECT TO THIS CODE

Lands and Structures Owned by the Mayor and City Council of Baltimore

Par. 1093. The provisions of this Code shall not apply to structures (other than buildings) owned by the Mayor and City Council of Baltimore, located on, upon, over or under streets, alleys or other public ways or lands, and which are designed, constructed, controlled and maintained by and under the authority and direct supervision of one or more of the Bureaus or Sub-Departments of the Department of Public Works, other than the Bureau of Buildings.

Public Service Structures on Streets

Par. 1094. The provisions of this Code shall not apply to poles, conduits, tunnels, pipe lines, manholes and other similar surface or subsurface structures, including their equipment, owned and controlled by a Public Service Corporation, located on, upon, over or under streets, alleys or other public ways or lands, the construction of which is authorized by the Mayor and City Council of Baltimore, and the installations of which are regulated and supervised by one of the Bureaus or Sub-Departments of the Department of Public Works, other than the Bureau of Buildings.

CHAPTER 11

ORGANIZATION

Sec. 110—Department of Public Works.
Sec. 111—Bureau of Buildings.
Sec. 112—Buildings Engineer.
Sec. 113—Personnel of Bureau of Buildings.
Sec. 114—Deputy Buildings Engineer.
Sec. 115—Electrical-Mechanical Engineer.
Sec. 116—Building Construction Engineer.
Sec. 117—Other Employees.
Sec. 118—Appointment of Employees.
Sec. 119—Salary of Employees.

SECTION 110

DEPARTMENT OF PUBLIC WORKS

Par. 1100. The Department of Public Works herein mentioned is the Department of Public Works of the Mayor and City Council of Baltimore, the head of which is the Chief Engineer of Baltimore.

SECTION 111

BUREAU OF BUILDINGS

Par. 1110. The Bureau of Buildings is one of the bureaus or sub-departments in the aforesaid Department of Public Works.

SECTION 112

BUILDINGS ENGINEER

Par. 1120. The head of the Bureau of Buildings referred to in Section 111 shall be the Buildings Engineer, who shall be appointed in accordance with the provisions of, and have the qualifications prescribed in, the Charter of the Mayor and City Council of Baltimore, 1938 Edition.

SECTION 113

PERSONNEL OF BUREAU OF BUILDINGS

Organization of Bureau of Buildings

Par. 1130. The Bureau of Buildings shall be divided into an administrative division, a building engineering division, an electrical-mechanical engineering division, a building construction division, and such other miscellaneous divisions as are deemed necessary by the Buildings Engineer, for the proper administration of the duties of the Bureau of Buildings.

Fixed Personnel of Bureau of Buildings

Par. 1131. The fixed personnel of the Bureau of Buildings shall consist of a Buildings Engineer; a Deputy Buildings Engineer, who shall be the head of the Building Engineering Division; a head of the Electrical-Mechanical Engineering Division; and a head of the Building Construction Division.

During the absence or incapacity of the Buildings Engineer, the Deputy Buildings Engineer shall perform the duties and exercise the powers of the Buildings Engineer.

Additional Personnel of Bureau of Buildings

Par. 1132. There shall be employed in the Bureau of Buildings a secretary to the Buildings Engineer and such other engineers, assistants, aides, inspectors, investigators, clerks, stenographers, attendants, laborers and other help as may be necessary for the proper administration of the duties of the Bureau of Buildings.

SECTION 114

DEPUTY BUILDINGS ENGINEER

Qualifications of Deputy Buildings Engineer

Par. 1140. The Deputy Buildings Engineer shall be not less than 30 years of age; a graduate of an engineering school of recognized standing and shall have had not less than 10 years experience in building construction, or, in lieu of the aforegoing education and experience, he shall have had not less than 15 years experience in important engineering work. For a period of not less than 5 years, he shall have been in responsible charge of important engineering projects. He shall have the ability, to design buildings and allied structures, to examine plans and check designs of new buildings and structures in order to determine whether such plans and designs are in conformity with the provisions of this Code, other ordinances and good engineering practice, to prepare specifications, estimates and reports, and to perform related work as required. He shall have tact, good judgment, initiative and executive ability, and he shall assist the Buildings Engineer generally and act for him during his absence or incapacity or when so directed.

SECTION 115

ELECTRICAL-MECHANICAL ENGINEER

Qualifications of Electrical-Mechanical Engineer

Par. 1150. The Electrical-Mechanical Engineer shall be not less than 30 years of age; a graduate of an engineering school of recognized standing and shall have had not less than 8 years experience in electrical or mechanical engineering, or in lieu of the aforegoing education and experience, he shall have had not less than 12 years' experience in electrical or mechanical engineering. For a period of not less than 4 years, he shall have been in responsible charge of important electrical or mechanical engineering projects. He shall have the ability to design electrical and mechanical engineering projects, to examine plans and check designs of any electrical and mechanical engineering projects in order to determine whether such plans and designs are in conformity with the provisions of this Code, or other ordinances, and good engineering practice, to prepare specifications, estimates and reports, to supervise the construction, installation, inspection, operation and maintenance of electrical, mechanical or other allied equipment and appliances in buildings and other structures, and to perform related work as required. He shall have tact, good judgment, initiative and executive ability.

SECTION 116

BUILDING CONSTRUCTION ENGINEER

Qualifications of Building Construction Engineer

Par. 1160. The Building Construction Engineer shall be not less than 30 years of age; a graduate of an engineering school of recognized standing and shall have had not less than 8 years experience in structural engineering, or, in lieu of the aforegoing education and experience, he shall have had not less than 12 years experience in structural engineering. For a period of not less than 4 years, he shall have been in responsible charge of important structural engineering projects. He shall have the ability, to design buildings and allied structures, to examine plans and check designs of new buildings and structures in order to determine whether such plans and designs are in conformity with the provisions of this Code, or other ordinances, and good engineering practice, to prepare reports, to supervise the construction, alteration, repair, maintenance and inspection of buildings and allied structures, and to perform related work as required. He shall have tact, good judgment, initiative and executive ability.

SECTION 117

OTHER EMPLOYEES

Qualifications of Other Employees

Par. 1170. All persons who may hereafter be employed in the Bureau of Buildings, and whose positions and duties require special knowledge or experience, shall have the necessary educational equipment and training or practical experience to qualify them for the duties to be performed by them.

SECTION 118

APPOINTMENT OF EMPLOYEES

Appointment of Personnel in Bureau of Buildings

Par. 1180. Any and all persons who may hereafter be appointed to any and all positions in the Bureau of Buildings shall be selected and appointed by the Buildings Engineer in accordance with any and all of the terms and provisions of Sections Nos. 268 to 284, inclusive, of the Charter of the Mayor and City Council of Baltimore, 1938 Edition, and in accordance with all of the terms and provisions of any and all laws, rules and regulations governing the Classified City Service of Baltimore.

SECTION 119

SALARY OF EMPLOYEES

Salary of Employees Fixed by Board of Estimates

Par. 1190. The compensation of the Buildings Engineer, the Deputy Buildings Engineer, the Electrical-Mechanical Engineer, the Building Construction Engineer, as well as the compensation of any and all other engineers and employees of the Bureau of Buildings, shall be subject to approval of the Board of Estimates of the Mayor and City Council of Baltimore, and shall be paid as provided in the annual Ordinance of Estimates.

CHAPTER 12

BUILDINGS ENGINEER

Sec. 120—General Powers of the Buildings Engineer.
Sec. 121—Duty to Enforce Code.
Sec. 122—Authority to Interpret Code.
Sec. 123—Authority to Issue Permits and Certificates.
Sec. 124—Authority to Make Inspections and Tests.
Sec. 125—Authority to Condemn Buildings.
Sec. 126—Authority to Make Rules and Regulations.
Sec. 127—Duty to Construct and Maintain Public Buildings.
Sec. 128—Duty to Keep Records and Make Reports.
Sec. 129—Identification of Employees.

SECTION 120

GENERAL POWERS OF THE BUILDINGS ENGINEER

General Power to Correct Unsafe Conditions

Par. 1200. Whenever any land, building, structure or other object, or any part thereof, is dangerous or unsafe or a menace to either the public health or safety, and the action to be taken to eliminate such dangerous or unsafe condition or conditions is not specifically provided for in this Code, the Buildings Engineer is hereby authorized and empowered to take such action as may be necessary to eliminate such dangerous or unsafe condition or conditions.

Enforcement by Buildings Engineer

Par. 1201. The Buildings Engineer is hereby authorized, empowered and charged with the duty of enforcing the provisions of this Code, in the form and manner herein prescribed, and the provisions of all other ordinances, laws or regulations of the Mayor and City Council of Baltimore pertaining or relating to the matters and things provided for in this Code.

The Buildings Engineer is hereby authorized and empowered to institute or cause to be instituted at any time any and all legal, equitable or criminal actions or proceedings of every kind and character which may be necessary and proper to enforce any and all of the provisions of this Code or any and all of the provisions of all other ordinances, laws or regulations of the Mayor and City Council of Baltimore pertaining or relating to the matters and things provided for in this Code.

Nothing contained in this Code shall be taken or construed to estop or prevent the Buildings Engineer from instituting or causing to be instituted or fully prosecuting at any time any and all legal or equitable actions or proceedings of any kind or character which may be necessary or proper to compel a full compliance with any and all of the provisions of this Code or of the provisions of all other ordinances, laws or regulations of the Mayor and City Council of Baltimore pertaining or relating to the matters and things provided for in this Code, even though criminal proceedings of any kind or character may be pending or may have been completed.

Right of Entry

Par. 1202. The Buildings Engineer or his authorized representative, upon exhibiting the proper credentials or proof of identity, if necessary, shall have the right to enter any building, structure or premises at any time during daylight hours, or at such other times as may be necessary in an emergency resulting from or arising out of any cause that endangers or tends to endanger the public health or safety, for the purpose of performing his duties under this Code or enforcing the provisions of this Code.

SECTION 122

AUTHORITY TO INTERPRET CODE

Interpretation by Buildings Engineer

Par. 1220. The Buildings Engineer shall determine the application of this Code, and shall pass on all questions relating to the interpretation of the various sections of this Code, their application, and all other questions of a similar nature.

Granting of General Certificates

Par. 1221. If any person shall desire to use materials or new or unusual methods of construction which are safe and in accordance with good engineering practice and in accordance with the spirit of this Code, although not in accordance with the strict letter of the requirements hereof, or if for any reason it shall be impossible for a person to comply with the exact provisions of this Code, or it shall be unreasonable to require a person to comply with the exact provisions of this Code, any such person may make written application to the Buildings Engineer stating his reasons for desiring to use materials or new or unusual methods of construction which are not permitted by the provisions of this Code, or setting forth the reasons why it is impossible for him to comply with the exact provisions of this Code, or why it would be unreasonable to require him to comply with the exact provisions of this Code. In every such case the Buildings Engineer shall fix an early date for a hearing at which time the applicant or his authorized representative may present to the Buildings Engineer such evidence in support of his application as may be proper and relevant to the subject under consideration. As soon as possible, after the conclusion of such hearing, the Buildings Engineer shall render his decision in writing, a copy of which shall be sent to the applicant, and such decision shall be permanently filed in the Bureau of Buildings.

In the event that the Buildings Engineer renders a decision in favor of the applicant, the Buildings Engineer shall then issue a general certificate in accordance with the provisions of Section 151 of this Code.

SECTION 123

AUTHORITY TO ISSUE PERMITS AND CERTIFICATES

Authority to Receive Applications and Issue Permits and Certificates

Par. 1230. The Buildings Engineer shall receive all applications, issue permits for all approved applications, and issue certificates, all in accordance with the provisions of Chapters 13, 14 and 15 of this Code.

SECTION 124

AUTHORITY TO MAKE INSPECTIONS AND TESTS

General Authority to Make Inspections and Tests

Par. 1240. The Buildings Engineer shall make any and all inspections and tests, or cause any and all inspections and tests to be made, as required by the provisions of this Code.

The Buildings Engineer is hereby authorized and empowered to deputize qualified employees of casualty insurance companies and other investigating or inspection agencies to make inspections or tests required by this Code when and where such inspection or testing work requires a particular and special knowledge or experience, or both, and when the Bureau of Buildings is not equipped to make such inspections or tests. Provided, however, before such deputies shall be appointed by the Buildings Engineer, such deputies shall have all of the qualifications specified by, and shall comply with any and all of the rules, regulations and requirements of, the City Service Commission of Baltimore.

In lieu of inspections and tests to be made by the Buildings Engineer, or the employees of the Bureau of Buildings, the Buildings Engineer is hereby authorized and empowered to accept, in his discretion, written reports of inspections or tests made or conducted by recognized laboratories or investigating or inspection agencies, if the Buildings Engineer is of the opinion, after a full investigation, that such laboratories or agencies are reliable and fully qualified to make such inspections or tests.

SECTION 125

AUTHORITY TO CONDEMN BUILDINGS

Condemnation by Buildings Engineer

Par.1250. Any and all land, buildings, structures, or other objects, and each and every part thereof, including any and all equipment contained therein, shall be kept and maintained in a safe and sound condition.

Whenever any land, building, structure or other object, or any part thereof, including any and all equipment contained therein, becomes, or is about to become, dangerous or unsafe or a menace to public health or safety, the Buildings Engineer is hereby authorized and empowered to condemn any such land, building, structure, or other object, or any part thereof, including any and all equipment contained therein.

SECTION 126

AUTHORITY TO MAKE RULES AND REGULATIONS

Rules and Regulations for Enforcement of Code

Par. 1260. The Buildings Engineer is hereby authorized and empowered to issue such orders and notices and to make such rules and regulations as may be necessary and proper, in the form and manner prescribed in Chapter 18 of this Code, to put into full force and effect any and all of the provisions of this Code.

SECTION 127

DUTY TO CONSTRUCT AND MAINTAIN PUBLIC BUILDINGS

General Requirements for Construction and Maintenance of Public Buildings

Par. 1270. The Buildings Engineer shall construct, alter, repair, maintain, service or raze every public building or structure when directed by the Board of Estimates or the Chief Engineer of the Mayor and City Council of Baltimore to do so.

Buildings Constructed by the Buildings Engineer

Par. 1271. The Buildings Engineer shall, when directed by the Board of Estimates or the Chief Engineer of the Mayor and City Council of Baltimore, design, prepare drawings, specifications, cost estimates, and direct or supervise the construction of all public buildings or structures whether constructed by day labor or contract.

Buildings Serviced by the Buildings Engineer

Par. 1272. The Buildings Engineer shall inspect, operate, maintain, repair and have complete charge and control of all public buildings or structures which have been or hereafter may be placed in the care and custody of the Buildings Engineer by the Mayor and City Council; and the Buildings Engineer shall appoint all necessary custodians, engineers, elevator attendants, watchmen, laborers, charwomen and such other employees that may be required, from time to time, to care for such public buildings or structures, and for which there is an appropriation in the annual Ordinance of Estimates.

City Buildings to be Inspected by Buildings Engineer

Par. 1273. The Buildings Engineer shall inspect, or cause to be inspected annually, each and every building and structure which may be in his care and custody or under his charge. The aforesaid inspection shall be made prior to the time when the Buildings Engineer is required by Section 41 of the Charter of the Mayor and City Council of Baltimore, 1938 Edition, to send to the Board of Estimates his estimate of the amount of money needed for the conduct of the Bureau of Buildings for the next ensuing fiscal year.

SECTION 128

DUTY TO KEEP RECORDS AND MAKE REPORTS

General Requirements for Keeping Records and Reports

Par. 1280. The Buildings Engineer shall keep any and all records and make any and all reports, in the manner and form provided for in Chapter 18 of this Code, that may be necessary for the proper administration of the Bureau of Buildings and this Code.

SECTION 129

IDENTIFICATION OF EMPLOYEES

Methods of Identifying Employees

Par. 1290. The Buildings Engineer shall adopt a badge or any other means of identification that may be sufficient for the purpose of identifying the employees of the Bureau of Buildings, which shall be exhibited by such employees upon the demand of anyone having the right to so demand. In the event of an emergency, the aforegoing means of identification, as well as any other proper method of establishing the identity of the employees of the Bureau of Buildings, shall be sufficient.

CHAPTER 13

APPLICATIONS FOR PERMITS

Sec. 130—General Requirements for Applications.
Sec. 131—New-Building Applications.
Sec. 132—Special-Structure Applications.
Sec. 133—Alteration Applications.
Sec. 134—Razing and Moving Applications.
Sec. 135—Electrical Applications.
Sec. 136—Mechanical Applications.
Sec. 137—Minor Privilege Applications.
Sec. 138—Inspection Applications for Licenses.
Sec. 139—Miscellaneous Applications.

SECTION 130

GENERAL REQUIREMENTS FOR APPLICATIONS

Required Applications

Par. 1300. Before any matter, thing, operation or work mentioned in, regulated or provided for by any provisions of this Code is started or commenced, and before any land, building or other structure is used for or in connection with any matter or thing mentioned in, regulated or provided for by any provisions of this Code, an application shall be filed in the Bureau of Buildings to obtain a proper permit; and no permit shall be issued by the Buildings Engineer unless and until such applications have first been filed in the Bureau of Buildings and approved by the Buildings Engineer.

No single application shall be accepted for two or more unit buildings or additions, on two or more lots, either existing or subsequently to be sub-divided, except in row house construction one application may be accepted to cover two or more house units which are separated from each other by party walls.

Classification of Applications

Par. 1301. Applications for permits shall be classified in accordance with the nature of the work or purpose for which a permit is requested, as follows:

1. New-building applications
2. Special-structure applications
3. Alteration applications
4. Razing and moving applications
5. Electrical applications
6. Mechanical applications

7. Minor privilege applications
8. Inspection applications for licenses
9. Miscellaneous applications

In case the nature of the work or the purpose for which a permit is requested can be covered by two or more classes of applications, the Buildings Engineer shall determine which class of application shall be used.

General Form of Applications

Par. 1302. All forms of applications provided for by the provisions of this Code, after being prepared by the Buildings Engineer, shall be submitted to the City Solicitor of the Mayor and City Council of Baltimore for his approval before such forms of applications shall be put in use.

Required Certificate from Bureau of Assessments

Par. 1303. Every person, firm or corporation making application to the Bureau of Buildings for a permit to erect or construct a new building or other new structure shall obtain from the Bureau of Assessments a certificate that all taxes are fully paid upon the land on which said new building or new structure is proposed to be erected, and such certificate shall be attached to and filed with the application filed in the Bureau of Buildings. No permit shall be issued by the Bureau of Buildings unless and until such said certificate is filed in the Bureau of Buildings.

Authority for Application

Par. 1304. In all cases where the provisions of this Code require that the written consent of any property owners must be secured before any operation or work is started or commenced, the written consent of such property owners shall be filed in the Bureau of Buildings before any permit shall be issued by the Buildings Engineer.

Requirements for Filing Applications

Par. 1305. All applications required by the provisions of this Code to be filed in the Bureau of Buildings shall be filled out in ink or by typewriter or by any other indelible process approved by the Buildings Engineer and such application shall be signed by either the owner of the premises where any proposed operation or work is to be performed or by his duly authorized agent, and such applications shall be filed in the Bureau of Buildings by such owner or agent, in person. At the time of the filing of such applications, all fees and service charges provided for in Section 170 of this Code shall be paid. All such applications, fees and service charges may be mailed to the Bureau of Buildings by special permission from the Buildings Engineer.

Where the same survey plats, plot plans, drawings, specifications or other data are required for two or more applications, the Buildings Engineer may require only such survey plats, plot plans, drawings, specifications or other data to be filed as are required for one application provided they are the same for all such applications and provided that they are all filed together at the same time.

Whenever drawings are required to be filed with the Bureau of Buildings by the terms and provisions of this Code and such drawings contemplate structural changes or structural work affecting public health or safety, there shall be impressed upon such drawings the seal of the registered licensed architect or the registered licensed professional engineer who prepared such drawings, or in lieu of the aforegoing requirements pertaining to the impression of the aforesaid seal, such drawings must be signed by the author thereof, if such author is not a registered licensed architect or a registered licensed professional engineer, and such drawings shall have attached thereto an affidavit made by the author of such drawings that he prepared the said drawings.

All applications to perform any operation or work required by any ordinances or resolutions of the Mayor and City Council, or by any law of the State of Maryland, to be designed, performed or supervised by licensed professional persons or licensed mechanics, shall be signed by such licensed persons or mechanics, certifying that such operation or work will be performed by them personally or that such operation or work will be done under their charge and supervision.

Revision of Applications

Par. 1306. Applications, drawings, specifications or other data submitted with the application, may be revised or changed at any time prior to the issuance of the permit.

All such changes or revisions shall be made by submitting new corrected applications, drawings, specifications or data, except that the Buildings Engineer may permit minor corrections to be made on such applications, drawings, specifications or other data by some indelible process.

Action on Applications

Par. 1307. Whenever an application, drawings, specifications, or other data accompanying an application for any purpose, is or are confusing, incomplete, incorrect, vague or deceptive, the Buildings Engineer shall disapprove the application until the said application, drawings, specifications, or other data, shall have been made clear and explicit and to conform in every respect to the requirements of this Code.

Voiding Applications

Par. 1308. An application may be voided by the Buildings Engineer, at the request of the applicant, or upon the filing in the Bureau of Buildings of a subsequent application, or upon the refusal of the applicant to conform to the requirements of this Code, or upon the failure of the applicant to take such proper action as may be necessary to eliminate any non-conformity with the requirements of this Code within a period of 90 days acting from the day when the applicant was notified of such non-conformity.

Every application shall become null and void if no permit has been issued within one year from the date such application is filed in the Bureau of Buildings.

Drawings, specifications, and other data filed with applications shall be returned to the applicant, if requested, before the application is voided.

SECTION 131

NEW-BUILDING APPLICATIONS

Scope of New-Building Applications

Par. 1310. A new-building application shall be filed with the Bureau of Buildings for every permit to erect or begin to erect or to construct every new building or other structure or continuous row houses separated only by party walls; for every permit to add to any existing building or other structure where such proposed addition exceeds 100 square feet in area or is more than one story in height; for every permit to add an additional story or stories to any existing building or other structure or any part thereof, which proposed story or stories exceed 600 square feet in area, or which may exceed 25 per cent of the area of the story immediately upon which any additional story or stories is or are proposed to be added; for every permit to erect, begin to erect, construct or reconstruct the foundation or substructure of any building or other structure which has been moved from another location; for every permit to reconstruct or restore every building or other structure which has been moved from another location; and for every permit for every special building, as defined in Section 490 of this Code.

Information on New-Building Applications

Par. 1311. Every new-building application shall contain the following information in reference to any or all of the operations set forth in Paragraph 1310 of this Code for which a permit is requested:

1. Location (street and number) of the premises on which the proposed building or addition is to be constructed or upon which any other operation is to be performed.

2. The full name and address of the owner, lessee, architect, engineer, and contractor or builder, of the proposed building or addition and that of the applicant.

3. The area of the lot or lots upon which the proposed building or addition is to be constructed or upon which any other operation is to be performed.

4. The area and height of the proposed building or addition.

5. The volume of the proposed building or addition in cubic feet.

6. The class of occupancy of the proposed building or addition.

7. The type of construction of the proposed building or addition or other operation.

8. Any and all other information that may be required by the Buildings Engineer to enable him to act upon such application.

Drawings with New-Building Applications

Par. 1312. With every new-building application, there shall be submitted not less than two copies of a survey plat of the lot or lots upon which the proposed new building or other structure is to be located, six copies of a situation or plot plan of the lot or lots upon which the proposed new building or other structure is to be located, indicating the location of the proposed new building or other structure in relation to all existing buildings and other structures on said lot or lots, and two sets of working drawings, except that a survey plat for additional stories on an existing building need not be submitted unless requested by the Buildings Engineer. In the case of small buildings which are less than 5,000 square feet in area and not over three stories high, and where the proposed building or other structure will cover the entire lot, the survey plat and the plot plan may be consolidated into one plan.

All drawings shall be drawn or printed in ink, or reproduced by some process that cannot be erased and will not fade, on cloth or durable paper.

The survey plats, plot plans, working drawings and other drawings shall be accurately drawn to such a scale that the design and details of construction may be shown completely without confusion to the persons who examine such plans or drawings. All principal dimensions shall be shown in figures. The sizes or dimensions of all structural parts shall be clearly stated.

In the event that the general drawings do not supply all the information required for proper examination, the Buildings Engineer shall require, if necessary, any additional detailed drawings to be submitted, which said additional drawings shall be drawn on a larger scale.

Specifications with New-Building Application

Par. 1313. With each new-building application, there shall be submitted at least two sets of specifications. Such specifications shall completely specify the quality of all materials entering into the building, the quality of the workmanship, and the manner in which the work is to be done.

Other Data with New-Building Applications

Par. 1314. In the event that the work contemplated by any new-building application is complicated or not easily understood, the Buildings Engineer, at his discretion, shall require structural computations, stress sheets, details, copies of notices, samples of materials, additional drawings and specifications, or other applicable data to be submitted with each such new-building application, in order to enable the Buildings Engineer to pass on such application.

SECTION 132

SPECIAL-STRUCTURE APPLICATIONS

Scope of Special-Structure Applications

Par. 1320. A special-structure application shall be filed with the Bureau of Buildings for every permit to erect or begin to erect, or to construct or reconstruct, or to add to every special structure within the scope of Sections 491 to 498, inclusive, of this Code.

A special-structure application shall be filed for each and every special structure or additions to existing special structures not on the same premises. No special-structure application shall be filed for buildings or structures covered by the provisions of Section 490 of this Code.

Information on Special-Structure Applications

Par. 1321. Every special-structure application shall contain the following information in reference to any or all of the operations set forth in Paragraph 1320 of this Code for which a permit is requested:

1. Location (street and number) of the premises on which the proposed special structure or addition is to be erected.
2. The full name and address of the owner, lessee, architect, engineer, and contractor or builder, of the proposed special structure or addition, and that of the applicant.
3. General description and size of the proposed special structure or addition.
4. Approximate cost of the proposed special structure or addition.
5. The purpose for which the proposed special structure or addition will be used.
6. The purpose for which the premises are used at the time the application is filed, and the purpose for which the entire premises will be used after the erection of such special structures or additions.
7. The type of construction of the proposed special structure or addition.
8. Any and all other information that may be required by the Buildings Engineer to enable him to act upon such application.

Drawings With Special-Structure Applications

Par. 1322. With every special-structure application, there shall be submitted not less than two copies of a survey plat of the lot or lots upon which the proposed special-structure or addition is to be located, two copies of a situation or plot plan of the lot or lots upon which the proposed special structure or addition is to be located, indicating the location of the proposed special structure or addition in relation to all existing buildings and other structures on said lot or lots, and two sets of working drawings, provided, however, that additional copies shall be furnished if requested by the Buildings Engineer.

The survey plats, working drawings, situation or plot plans and other drawings shall be drawn or printed in ink, or reproduced by some process that cannot be erased and will not fade, on cloth or durable paper. They shall be accurately drawn to such a scale that the design and details of construction may be shown completely without confusion to the persons who examine such plans or drawings. All principal dimensions shall be shown in figures. The size or dimensions of all structural parts shall be clearly stated.

In the event that the general drawings do not supply all the information required for proper examination, the Buildings Engineer shall require, if necessary, any additional detailed drawings to be submitted, which said additional drawings shall be drawn on a larger scale.

Specifications With Special-Structure Applications

Par. 1323. With every special-structure application there shall be submitted at least two sets of specifications. Such specifications shall completely specify the quality of all materials entering into the special structure, the quality of the workmanship and the manner in which the work is to be done.

Other Data With Special-Structure Applications

Par. 1324. In the event that the work contemplated by any special-structure application is complicated or not easily understood, the Buildings Engineer, at his discretion, shall require structural computations, stress sheets, details, copies of notices, samples of materials, additional drawings and specifications, or other applicable data to be submitted with each such special-structure application, in order to enable the Buildings Engineer to pass on such application.

SECTION 133

ALTERATION APPLICATIONS

Scope of Alteration Applications

Par. 1330. An alteration application shall be filed with the Bureau of Buildings for every permit to change or alter the use or occupancy of any land, building or other structure, or to change, alter or repair any building or other structure, in cases where this Code does not require the filing of a new-building application or a special-structure application, and an alteration application shall be filed for every permit to add to any building or other structure in cases where this Code does not require for such addition the filing of a new-building application or special-structure application.

Information on Alteration Applications

Par. 1331. Every alteration application shall contain the following information in reference to any or all of the operations set forth in Paragraph 1330 of this Code for which a permit is requested:

1. Location (street and number) of the premises where any of the things which may be done under an alteration permit are to be done.

2. The full name and address of the owner or lessee of the property on which operations are to be conducted, as well as that of the architect, engineer, and contractor or builder, of the proposed operation, and that of the applicant.

3. The purpose for which the premises are used at the time the application is filed, and the purpose for which the entire premises will be used after the completion of the proposed operation.

4. General description of the work to be done.

5. The approximate cost of the work to be done.

6. The area and height of the building, or land, upon which the contemplated operations are to be performed.

7. The type of construction of existing buildings or other structures upon which the proposed operations are to be performed.

8. Any and all other information that may be required by the Buildings Engineer to enable him to act upon such application.

Drawings With Alteration Applications

Par. 1332. With every alteration application for a permit to change, alter, repair or add to a building or other structure, with changes, alterations, repairs or additions involve structural changes, there shall be submitted not less than two copies of all drawings, showing in detail the nature of the work to be done, including the existing conditions and the proposed changes, alterations, repairs or additions. No drawings need be filed with applications for minor changes, alterations, repairs or additions unless specifically required by the Buildings Engineer.

Specifications With Alteration Applications

Par. 1333. With every alteration application there shall be submitted at least two sets of specifications. Such specifications shall completely specify the quality of all materials entering into the work, the quality of the workmanship and the manner in which the work is to be done.

Other Data With Alteration Applications

Par. 1334. In the event that the work contemplated by any alteration application is complicated or not easily understood, the Buildings Engineer, at his discretion, shall require structural computations, stress sheets, details, copies of notices, samples of material, additional drawings and specifications, or other applicable data to be submitted with each such alteration application, in order to enable the Buildings Engineer to pass on such application.

Alteration Applications Not Required

Par. 1338. Alteration applications shall not be required for making minor repairs which cost no more than $10.00 and involve no structural changes, unless required by the Buildings Engineer, nor shall such applications be required for the interior decorating of walls, such as painting and wallpapering, nor for exterior painting, window washing, or other similar service.

SECTION 134

RAZING AND MOVING APPLICATIONS

Scope of Razing and Moving Applications

Par. 1340. A razing or moving application shall be filed with the Bureau of Buildings for every permit to raze, demolish or move every building or other structure, except miscellaneous structures defined in Section 499 of this Code.

A razing or moving application shall be filed for each and every building or other structure to be razed, demolished or moved, except that no razing or moving application shall be filed for structures covered by the provisions of Section 499 of this Code.

Information on Razing and Moving Applications

Par. 1341. Every razing or moving application shall contain the following information in reference to any or all of the operations set forth in Paragraph 1340 of this Code for which a permit is requested:

1. Location (street and number) of the premises on which the building or structure to be razed, demolished or moved is located.
2. The name in full and address of the owner or lessee of the building or structure to be razed, demolished or moved, and of the contractor, builder, or other person to be in charge of the proposed operations, as well as the full name and address of the applicant.
3. Area and height of the building or other structure to be razed, demolished or moved.
4. Volume of the building or other structure to be razed or moved, in cubic feet.
5. Type of construction of the building or other structure to be razed or moved.
6. Previous use of the building or other structure to be razed or moved.
7. Whether building or other structure is to be razed, demolished, or moved to new location.
8. New location (street and number) of the building or other structure, if the building or other structure is to be moved.
9. Purpose for which removed building or other structure in new location will be used.
10. Method of procedure proposed to be followed in the razing, demolition or moving of the building or other structure.
11. Manner in which sidewalks, or other public ways, will be protected in connection with any or all operations contemplated or proposed.
12. If the building or other structure is to be moved, the route that is proposed to be followed in the moving of the said building or other structure.
13. Any and all other information that may be required by the Buildings Engineer to enable him to act upon such application.

Drawings with Razing and Moving Applications

Par. 1342. With every razing or moving application there shall be submitted at least two copies of a situation or plot plan of the building or other structure to be razed, demolished or moved, drawn to scale, showing the location and dimensions of the lot, the lot number, the names and width of all streets, alleys or ways upon which the lot or site abuts and the location and dimensions of all buildings or other structures to be razed, demolished or moved, as well as those of other buildings or structures thereon. The plot plan shall be 8½ by 11 inches in size, or multiples thereof.

Specifications with Razing and Moving Applications

Par. 1343. No specifications need be submitted with razing or moving applications unless specifically required by the Buildings Engineer, and he is hereby authorized to require such specifications.

Other Data with Razing and Moving Applications

Par. 1344. In the event that the work contemplated by any razing or moving application is complicated or not easily understood, the Buildings Engineer, in his discretion, shall require structural computations, stress sheets, details, copies of notices, samples of materials, additional drawings and specifications, or other applicable data to be submitted with each such razing or moving application, in order to enable the Buildings Engineer to pass on such application.

Approval by Other Bureaus of Razing and Moving Applications

Par. 1346. Every razing or moving application shall be approved by the Bureau of Water Supply, the Bureau of Sewers and the Bureau of Highways of the Mayor and City Council of Baltimore, before a permit for the work may be issued by the Buildings Engineer.

Every razing or moving application shall have endorsed thereon by the Bureau of Liens of the Mayor and City Council of Baltimore a statement to the effect that any and all taxes, liens or other public charges due and owing upon the property involved in any razing or moving application have been paid before such application is filed in the Bureau of Buildings.

SECTION 135

ELECTRICAL APPLICATIONS

Scope of Electrical Applications

Par. 1350. An electrical application shall be filed with the Bureau of Buildings for a permit to locate, construct, reconstruct, alter, remove or install any and all electric wiring, and any and all electrical appliances or equipment, of any and all current capacities, voltages and frequencies, or to perform any and all electrical work of whatsoever kind, character, or description; whether inside or outside of any building or other structure.

Information on Electrical Applications

Par. 1351. Every electrical application shall contain the following information in reference to any or all of the operations set forth in Paragraph 1350 of this Code for which a permit is requested:

1. Location (street and number) of the building, other structures or premises, where the proposed electrical work is to be done, or other operations are to be performed.
2. The name in full and address of the owner or lessee of the building or other structure, or premises, where the proposed operations are to be conducted, and the full name and address of the mechanical or electrical engineer or licensed contractor to be in charge of the proposed operations, as well as the full name and address of the applicant.
3. Area, height and volume of the building or other structure where the proposed operations are to be carried on.
4. The type of construction of the building or other structure in which the proposed electrical operations are to be performed.
5. Purpose for which the building or other structure or premises where the proposed operations are to be performed is used at the time the application is filed.
6. Purpose for which the building or other structure where the proposed operations are to be performed will be used after the completion of the proposed operations.
7. Number of electric meters in or on the building or other structure or premises where the proposed operations are to be performed, and the number of new electric meters to be installed in connection with the proposed operations.
8. The voltage and kind of current supplied from the generating source of electric power to the building or other

structure or premises where the proposed operations are to be performed, at the time when the application is filed.

9. Kind of existing wiring system or the kind of wiring system to be installed in or on the building, or other structure, or premises where the proposed operations are to be performed.

10. Whether any alterations are to be made, or mechanical work is to be done, on or in the building or structure, or premises, where the proposed operations are to be performed, in connection with this application.

11. Signature and address of licensed electrician who will do or have charge of the operations proposed to be performed.

12. Any and all other information that may be required by the Buildings Engineer to enable him to act upon such application.

Drawings with Electrical Applications

Par. 1352. With each electrical application, there shall be submitted at least two copies of diagram drawings showing the areas to be lighted, power loads before applying demand factor, the demand factor selected, the computed load after applying demand factor, all loads other than lighting, the conductor size for all electrical feeders, and the location of all distribution centers.

Where such information can be shown clearly and completely on the application form, the Buildings Engineer, in his discretion, shall not require such diagram drawings to be submitted.

Specifications with Electrical Applications

Par. 1353. At least two sets of specifications shall be submitted with each electrical application with which diagram drawings are required to be submitted. Such specifications shall completely specify the quality of all materials and workmanship, and the manner in which the work is to be done.

Other Data with Electrical Applications

Par. 1354. In the event that the work contemplated by any electrical application is complicated or not easily understood, the Buildings Engineer, in his discretion, shall require such records of tests, samples, additional drawings and specifications, or any other applicable data to be submitted with every such electrical application, in order to enable the Buildings Engineer to pass on such application.

SECTION 136

MECHANICAL APPLICATIONS

Scope of Mechanical Applications

Par. 1360. A mechanical application shall be filed with the Bureau of Buildings for every permit to locate, erect, begin to erect, construct, reconstruct, alter, remove or install, in whole or in part, any and every elevator or other hoisting mechanism, power operated machinery, steam boiler, furnace and fuel burning system, heating or ventilating system, refrigerating system, tank, fire extinguishing appliance or any and all other mechanical equipment of whatsoever kind or character, except plumbing operations, whether inside or outside of any building or other structure.

Information on Mechanical Applications

Par. 1361. Every mechanical application shall contain the following information in reference to any or all of the operations set forth in Paragraph 1360 of this Code for which a permit is requested:

1. Location (street and number) of the building, other structure or premises, where the proposed mechanical work is to be done, or other operations are to be performed.

2. The name in full and address of the owner or lessee of the building or other structure, or premises, where the proposed operations are to be conducted, and the full name and address of the mechanical engineer or mechanical contractor to be in charge of the installation, and the full name and address of the applicant.

3. Area, height and volume of the building or other structure where the proposed operations are to be carried on.

4. The type of construction of the building or other structure in which the proposed mechanical operations are to be performed.

5. Purpose for which the building or other structure or premises where the proposed operations are to be performed is used at the time the application is filed.

6. Purpose for which the building or other structure where the proposed operations are to be performed will be used after the completion of the proposed operations.

7. Type, size and capacity of all appliances or equipment to be installed in connection with the proposed operations.

8. Description of foundations or supports of the building or other structure in which the proposed operations are to be performed.

9. Any and all other information that may be required by the Buildings Engineer to enable him to act upon such application.

Drawings with Mechanical Applications

Par. 1362. With every mechanical application, there shall be submitted at least two copies of drawings as follows:

a. Elevators, Hoists and Conveyors: As required in Paragraph 9103 of this Code.

b. Power Machinery: Layout drawings showing the proposed location of power machinery in the building or other structure in which such machinery is to be installed, together with details of foundations or supports of all such machinery.

c. Steam Boilers: Layout drawings showing the proposed location of the steam boilers and immediate piping in connection therewith in the building or other structure in which such steam boilers, except boilers for domestic heating plants, are to be installed, and detailed design drawings of all steam boilers of over 100 horsepower.

d. Furnaces and Fuel-burning Systems: Layout drawings showing the proposed location of furnaces and fuel-burning systems and immediate piping in connection therewith and fuel storage in the building or other structure in which such systems are to be installed, and detail drawings of all such systems, except those of domestic heating plants.

e. Heating and Ventilating: Layout and general design drawings of proposed heating or ventilating systems in buildings containing more than 15 rooms or more than 25,000 cubic feet in volume.

f. Refrigeration: As required in Paragraph 9603 of this Code.

g. Tanks: Layout drawings showing the proposed location of the tanks and piping in or on the building or other structure or premises in which such tanks are to be installed, and detail drawings and specifications of all tanks to be constructed or erected on the premises concerned, except that no drawings shall be required for T1, small Metal Tanks, as classified in Paragraph 9702 of this Code.

h. Fire-extinguishing Appliances: Layout drawings showing the proposed piping layout and capacity of all tanks and pumps, together with the proposed location of such equipment or appliances in the building or other structure in which such equipment or appliances are to be installed. Such drawings for standpipe systems shall also show the location of the additional equipment or appliances specified in Paragraph 9810.

Specifications with Mechanical Applications

Par. 1363. At least two sets of specifications shall be submitted with each mechanical application for new elevators, hoists and conveyors, power boilers of 100 horsepower and over, furnaces and fuel burning systems and heating and ventilating systems in buildings of more than 75,000 cubic feet in volume, refrigerating installations of Class A and Class B systems as classified in Chapter 96 of this Code, all tanks, and all fire-extinguishing appliances. Such specifications shall completely specify the quality of all materials and workmanship, and the manner in which the work is to be done.

Other Data with Mechanical Applications

Par. 1364. In the event that the work contemplated by any mechanical application is complicated or not easily understood, the Buildings Engineer, in his discretion, shall require such records of tests, samples, additional drawings and specifications, or any other applicable data to be submitted with every such electrical application, in order to enable the Buildings Engineer to pass on such application.

SECTION 137

MINOR PRIVILEGE APPLICATIONS

Scope of Minor Privilege Applications

Par. 1370. Every minor privilege application shall be filed in accordance with the provisions of Section 47 entitled "Grants of Franchises", and Sub-Section (6) entitled "Bureau of Buildings" of Part I of Section 105 of the Charter of the Mayor and City Council of Baltimore, 1938 Edition.

SECTION 138

INSPECTION APPLICATIONS FOR LICENSES

Scope of Inspection Applications for Licenses

Par. 1380. An inspection application shall be filed for every permit to secure a license to use any land, building or other structure as a theater, opera house, moving picture theater, dance hall, skating rink, auditorium, assembly hall, music hall, arena, stadium, or for any other use as a place of public assembly, or for any other use for which a license must be secured in accordance with the ordinances, resolutions or laws of the Mayor and City Council of Baltimore, or the State of Maryland.

Information on Inspection Applications for Licenses

Par. 1381. Every inspection application shall contain the following information in reference to any or all uses of any land, buildings or other structures, as provided in Paragraph 1380 of this Code for which a permit is requested:

1. The location (street and number) of the land, building or other structure concerned.
2. The name and address in full of the owner or lessee of the land, building or other structure concerned, together with the name and address in full of the applicant.
3. The established class of occupancy of the land, building or other structure concerned.
4. The type of construction of the building or other structure concerned.
5. The area, height and volume of the building or other structure concerned.
6. The seating capacity of the building or other structure concerned.
7. The purpose for which the permit is desired.
8. A description of the projection booth, the moving picture machine, and the kind of films located or to be used in the building or other structures concerned.
9. Any and all other information that may be required by the Buildings Engineer to enable him to act upon such application.

Other Data With Inspection Applications for Licenses

Par. 1384. With every inspection application there shall be submitted such records of tests, structural design drawings, computations and any other additional applicable information or data that may be reasonably necessary to enable the Buildings Engineer to determine whether the land, building or other structure mentionel in such application is safe for the purpose for which it is used or intended to be used.

SECTION 139

MISCELLANEOUS APPLICATIONS

Scope of Miscellaneous Applications

Par. 1390. A miscellaneous application shall be filed for every permit, to construct miscellaneous structures as defined in Section 499 of this Code; for grading, excavating, or otherwise altering the physical condition of land, and for paving or improving the surface of land, and for any and all other work of every kind or character provided for by the provisions of this Code or which is within the scope of this Code but which is not within the scope of the other classes of applications provided for in this Code.

Information on Miscellaneous Applications

Par. 1391. Every miscellaneous application shall contain the following information in reference to any or all of the operations set forth in Paragraph 1410 of this Code for which a permit is requested:

1. Location (street and number) of the premises where any operation or work is proposed to be performed or done.
2. The full name and address of the owner or lessee of the premises where proposed operations or work are or is to be performed, as well as that of the architect, engineer, contractor or builder of the proposed project, and that of the applicant.
3. A general description of the operation or work proposed to be performed or done.
4. Any and all other information that may be required by the Buildings Engineer to enable him to act upon such application.

Drawings With Miscellaneous Applications

Par. 1392. With every miscellaneous application there shall be filed at least two copies of a situation or plot plan of the location, showing the extent of the operation or work proposed to be performed or done.

Specifications With Miscellaneous Applications

Par. 1393. With every miscellaneous application there shall be submitted such specifications as may be required by the Buildings Engineer to satisfactorily specify the quality of the materials and the quality of the workmanship and the method of doing the work.

Other Data With Miscellaneous Applications

Par. 1394. In the event that the work contemplated by any miscellaneous application is complicated or not easily understood, the Buildings Engineer, in his discretion, shall require such records of tests, samples, additional drawings, and specifications or any other applicable data which may be necessary to be submitted with every such miscellaneous application in order to enable the Buildings Engineer to pass upon such application.

CHAPTER 14

PERMITS

Sec. 140—General Requirements for Permits.
Sec. 141—New-Building Permits.
Sec. 142—Special-Structure Permits.
Sec. 143—Alteration Permits.
Sec. 144—Razing and Moving Permits.
Sec. 145—Electrical Permits.
Sec. 146—Mechanical Permits.
Sec. 147—Minor Privilege Permits.
Sec. 148—License Permits.
Sec. 149—Miscellaneous Permits.

SECTION 140

GENERAL REQUIREMENTS FOR PERMITS

Required Permits and Issuance Thereof

Par. 1400. No matter, thing, operation or work mentioned in, regulated or provided for by any provisions of this Code shall be started or commenced, and no land, building or other structure shall be used for or in connection with any matter or thing mentioned in, regulated or provided for by any provisions of this Code, until and after a proper permit has been issued by and obtained from the Buildings Engineer.

After the application, drawings, plans, specifications, together with any and all other information or data required by the provisions of this Code to be submitted to the Buildings Engineer have been so submitted and have been examined and found to conform to all of the relative requirements of this Code, other ordinances or resolutions of the Mayor and City Council of Baltimore and the laws of the State of Maryland, the Buildings Engineer shall then issue a proper permit. No permit, however, shall be issued in connection with any or all of the matters or things involved in Paragraph 1221 of this Code until and after a proper general certificate has been issued by the Buildings Engineer in accordance with the provisions of Paragraph 1221 of this Code.

Provided, however, that:

(a) No permit shall be issued for the construction, erection, or conversion of, or addition to, any building or other structure to be used for a motion picture theatre or theatre, until an application for such permit is first assented to by the Mayor and City Council of Baltimore by Ordinance; and

(b) No permit shall be issued for the construction or erection of any tourist cabin, nor for the conversion of any building or other structure into a tourist cabin, until an application for such permit is first assented to by the Mayor and City Council of Baltimore by Ordinance; and

(c) No permit shall be issued for the construction, erection or alteration of any trailer camp or any part thereof, nor for the performance of any operation or the doing of any work in connection with any trailer camp, until an application for such permit is first assented to by the Mayor and City Council of Baltimore by Ordinance; and

(d) No permit shall be issued for the construction, erection, or conversion of, or addition to any building or other structure to be used for an automobile repair shop or garage for the storage of more than (3) motor vehicles within 300 feet of any building or structure used as a church, orphanage, school, or hospital until, an application for such permit is first assented to by the Mayor and City Council of Baltimore by Ordinance; and

(e) No permit shall be issued for the construction or erection of or addition to any illuminated sign exceeding 100 square feet in area or any flasher sign whatever located or supported on the roof of any building or other structure until an application for such permit is first assented to by the Mayor and City Council of Baltimore by ordinance.

Classification of Permits

Par. 1401. Permits shall be classified in accordance with the nature of the work or purpose for which they are requested, as follows:

New-Building Permits.
Special-Structure Permits.

Alteration Permits.
Razing and Moving Permits.
Electrical Permits.
Mechanical Permits.
Minor Privilege Permits.
License Permits.
Miscellaneous Permits.

General Forms of Permits

Par. 1402. Every permit shall be issued on a form provided by the Buildings Engineer for the specific purpose for which it is intended, and every permit shall have impressed thereon the name of the Buildings Engineer.

All forms of permits provided for by the provisions of this Code, after being prepared by the Buildings Engineer, shall be submitted to the City Solicitor of the Mayor and City Council of Baltimore for his approval before such forms of permits shall be put in use.

Posters for Permits

Par. 1403. With every permit issued by the Buildings Engineer, there shall also be furnished by the Buildings Engineer a poster or sign of a size and form to be determined by the Buildings Engineer, which poster or sign shall state the kind of permit issued and a condensed statement of the work to be done thereunder, and which poster or sign shall be of the color prescribed herein for the various classes of permits. If the person, firm or corporation to whom a permit is issued desires, he or it may furnish his or its own poster, in conformity with the requirements of Chapter 14, which poster may bear his or its name, address and business advertisement.

No poster shall be displayed at the location of any operations or work provided for by this Code until the permit therefor, which is required by this Code, shall have been issued, and after the issuance of such a permit and during the course of the said operations or the performance of the work authorized by the said permit, the aforesaid poster or sign shall be conspicuously displayed at all times on the premises where the operation or work is in progress.

Permit Drawings and Specifications

Par. 1404. A true and correct copy of all drawings, specifications, and all relative data which are required by the provisions of this Code to be approved by the Buildings Engineer, and which have been approved by the said Buildings Engineer, shall be kept on the site of the operations or work at all times while the said operations or work are or is in progress, and the same shall be accessible to all duly authorized representatives of all bureaus, boards, commissions, departments, subdepartments or other agencies of the Mayor and City Council of Baltimore.

Scope of Authority of Permits

Par. 1405. A permit shall be a license to do, perform or exercise the operation, work, matter, thing or use specifically authorized thereby to be done, but in no case shall a permit be construed as authority to violate, cancel, alter, modify or set aside any of the provisions of this Code, other ordinances or resolutions of the Mayor and City Council of Baltimore, or the laws of the State of Maryland. The issuance of any permit shall not prevent the Buildings Engineer from thereafter revoking the same because of a violation of this Code, or ordinance or resolution of the Mayor and City Council of Baltimore or laws of the State of Maryland, nor shall the issuance of a permit prevent the Buildings Engineer from thereafter requiring the correction of any errors in any plans or drawings or in the actual work or operations.

Under no circumstances shall any permit be construed or considered as a certificate, provision for which is made by Chapter 15 of this Code.

Authority to Refuse Permits

Par. 1406. Every application for any operation, work, matter, thing or use provided for by the provisions of this Code which may, upon its face, or upon examination, disclose a situation that is or may be a menace or dangerous to the public health or safety, shall not be approved by the Buildings Engineer.

Voiding Permits

Par. 1407. Every permit issued in violation of the provisions of this Code, other ordinances or resolutions of the Mayor and City Council of Baltimore or laws of the State of Maryland, or without proper authority, are null and void, and the status of any such permit shall be the same as though it had never been issued.

In the event that any application or any drawings, plans, specifications or other data submitted in connection therewith shall contain any false or misleading statements or misrepresentations of any facts or conditions, any permit issued based upon such application shall be null and void.

No permit issued under the provisions of this Code, as well as any and all drawings, plans, specifications or other papers which may be a part thereof, shall be changed or defaced by anyone other than the Buildings Engineer, and if any change or defacement of any of such papers is unlawfully made, such permit shall be null and void.

Violations of Permits

Par. 1408. Failure to use the materials or the type or kind of equipment or the method of construction or the manner of installation approved by the Buildings Engineer in any permit issued, or the failure to structurally comply with any and all of the requirements of an approved application and all other plans, drawings, specifications or any other approved data submitted with such application, or the failure to comply with any of the requirements of this Code, shall constitute and be a violation of the permit issued and shall subject the violator to the penalties and fines prescribed in Section 192 of this Code.

Failure to Secure Permits

Par. 1409. In the event that any matter, thing, operation or work mentioned in, regulated or provided for by any provisions of this Code is started, commenced or done prior to the issuance by and obtainment from the Buildings Engineer of a proper permit, or in the event that any land, building or other structure is used for or in connection with any matter or thing mentioned in, regulated or provided for by any provisions of this Code prior to the issuance by and obtainment from the Buildings Engineer of a proper permit, any such action shall be and constitute a violation of the provisions of this Code and shall subject the violator to the applicable penalties and fines prescribed in Section 192 of this Code.

In addition to the aforegoing, in the event that any matter, thing, operation or work for which a permit is required by this Code is started, commenced or done prior to the issuance by and obtainment from the Buildings Engineer of a proper permit, or in the event that any land, building or other structure is used for or in connection with any matter or thing mentioned in, regulated or provided for by any provisions of this

Code prior to the issuance by and obtainment from the Buildings Engineer of a proper permit, the Buildings Engineer is hereby authorized and empowered to immediately stop any and all operations, acts or work being performed or done for which no permit has been first obtained or to prevent the use of any land, building or other structure for which no proper permit has been first obtained.

SECTION 141

NEW-BUILDING PERMITS

Scope of New-Building Permits

Par. 1410. New-building permits shall be issued upon all new-building applications which have been properly filed and approved as provided by the provisions of this Code. Such permits shall cover and include all labor and materials necessary to excavate and grade the land for foundations and to construct the building complete and may include walkways, driveways, curbing, walls and fences if called for in the application, shown on the drawings and covered in the specifications. No such permit shall cover or include electrical work, or mechanical work, or minor privileges, or alterations to existing buildings, or other structures, or underpinning operations, or the razing, demolition, moving or removing of buildings or other structures, for all of which operations or work separate permits as required by this Code shall be obtained.

Temporary offices, warehouses, sheds, hoists, conveyors, derricks, scaffolding and other similar structures and equipment used in construction operations may be included in a new-building permit if the application for said new-building permit includes a request for permission to use such temporary structures or equipment. Otherwise, after the issuance of the new-building permit, a separate application shall be filed and a separate permit shall be secured for such temporary structures or equipment.

Notice to Adjoining Owners

Par. 1411. Whenever any operation or work under a new-building permit requires excavating to be done to a depth of three feet or more within 2 feet of any adjoining property, the applicant for the permit shall notify the owners and occupants of such adjoining property in writing of the operation or work that is proposed to be performed or done. A copy of such notification together with evidence satisfactory to the Buildings

Engineer that the notification has been received by the said owners and occupants of the adjoining property, shall be filed in the Bureau of Buildings before such permit is issued.

Notices of proposed underpinning of adjoining property, including excavations or other changes in the physical condition of the land to be made in connection with underpinning, shall be given as required in Paragraph 1431 of this Code.

Posting New-Building Permits

Par. 1412. In all cases where an operation or work is being performed under a new-building permit, the poster or sign required by the provisions of Paragraph 1403 of this Code shall be conspicuously displayed upon that part of the site of such operation or work which is closest to a street or public highway so that such said poster or sign shall be visible to the general public at all times.

Posters for new-building permits shall be light buff or similar light color with black lettering.

Amending New-Building Permits

Par. 1416. New-building permits shall not be amended except by the filing of a new and additional application with all necessary plans, drawings, specifications, and other required data, upon which new and additional application and other data the Buildings Engineer shall issue a new permit, if said application and other data conform to the requirements of this Code, other ordinances or resolutions of the Mayor and City Council of Baltimore, and the laws of the State of Maryland. Such new permits shall not be issued, however, until the old permit which is being amended by the new permit has been surrendered and voided. Amendments, however, which, in the judgment of the Buildings Engineer, will only result in minor changes or alterations in the work or thing authorized to be done by a new-building permit, may be permitted by the buildings Engineer without the necessity of filing and securing the approval of a new application. In the event of such amendments being permitted by the Buildings Engineer without the filing of a new application, the amendments shall be made by proper notations placed by the Buildings Engineer on the original application and original permit as well as on any and all approved drawings, plans, specifications and other data forming a part thereof. No new-building permit shall be amended or changed until after the Buildings Engineer has received in writing, on a form furnished by the Buildings Engineer, the consent of the owner of the proposed building, to the requested amendment or change in any such permit.

Time Limitations of New-Building Permits

Par. 1417. After a new-building permit is issued, if the operation or work authorized and approved thereunder is not commenced within one year after the date of issue, or if, after commencement of the operation or work, the operation or work is suspended or discontinued for a period of one year, then, in either case, the said permit shall be null and void, and no operations or work shall be again commenced unless and until after another proper permit shall have been issued.

Partial New-Building Permits

Par. 1418. The Buildings Engineer may, at his discretion, issue a partial permit to proceed with a specific part of any new-building work or operations provided the established cost of any proposed building exceeds the sum of $10,000.00.

No operations or work authorized by a partial permit shall proceed beyond the limitations specified in any such permit.

SECTION 142

SPECIAL-STRUCTURE PERMITS

Scope of Special-Structure Permits

Par. 1420. Special-structure permits shall be issued upon all special-structure applications which have been properly filed and approved as provided by the provisions of this Code. Such permits shall cover and include all labor and materials necessary to excavate and grade the land for foundations and to construct the special structure complete. No such permit shall cover or include electrical work, or mechanical work, or minor privileges, or alterations to existing buildings, or other structures, or underpinning operations, or the razing, demolition, moving or removing of buildings or other structures, for all of which operations or work separate permits as required by this Code shall be obtained.

Temporary offices, warehouses, sheds, hoists, conveyors, derricks, scaffolding and other similar structures and equipment used in construction operations may be included in a special-structure permit if the application for said special-structure permit includes a request for permission to use such temporary structures or equipment. Otherwise, after the issuance of the special-structure permit, a separate application shall be filed and a separate permit shall be secured for such temporary structures or equipment.

Notice to Adjoining Owners

Par. 1421. Whenever any operation or work under a special-structure permit requires excavating to be done to a depth of three feet or more within 2 feet of any adjoining property, the applicant for the permit shall notify the owners and occupants of such adjoining property in writing of the operation or work that is proposed to be performed or done. A copy of such notification, together with evidence satisfactory to the Buildings Engineer, that the notification has been received by the said owners and occupants of the adjoining property, shall be filed in the Bureau of Buildings before the permit is issued.

Notices of proposed underpinning of adjoining property and notices of excavations or other changes in the physical condition of the land shall be given as required in Paragraph 1431 of this Code.

Posting Special-Structure Permits

Par. 1422. In all cases where an operation or work is being performed under a special-structure permit, the poster or sign required by Paragraph 1403 of this Code shall be conspicuously displayed upon that part of the site of such operation or work which is closest to a street or public highway, so that such said poster or sign shall be visible to the general public at all times.

Posters for special-structure permits shall be gray with black lettering.

Amending Special-Structure Permits

Par. 1426. Special-structure permits shall not be amended except by the filing of a new and additional application with all necessary plans, drawings, specifications, and other required data, upon which new and additional application and other data the Buildings Engineer shall issue a new permit, if said application and other data conform to the requirements of this Code, other ordinances or resolutions of the Mayor and City Council of Baltimore, and the laws of the State of Maryland. Such new permits shall not be issued, however, until the old permit which is being amended by the new permit has been surrendered and voided. Amendments, however, which, in the judgment of the Buildings Engineer, will only result in minor changes or alterations in the work or thing authorized to be done by a special-structure permit, may be permitted by the Buildings Engineer without the necessity of filing and securing the approval of a new application. In the event of such amendments being permitted by the Buildings Engineer without the filing of a new application, the amendments shall be made by proper notations placed by the Buildings Engineer on the original application and original permit as well as on any and all approved drawings, plans, specifications and other data forming a part thereof. No special-structure permit shall be amended or changed until after the Buildings Engineer has received in writing, on a form furnished by the Buildings Engineer, the consent of the owner of the proposed building, to the requested amendment or change in any such permit.

Time Limitations of Special-Structure Permits

Par. 1427. After a special-structure permit is issued, if the operation or work authorized and approved thereunder is not commenced within three months after the date of issue, or if, after commencement of the operation or work, the operation or work is suspended or discontinued for a period of one year, then, in either case, the said permit shall be null and void, and no operations or work shall be again commenced unless and until after another proper permit shall have been issued.

Partial Special-Structure Permits

Par. 1428. The Buildings Engineer may, at his discretion, issue a partial permit to proceed with a specific part of any special-structure work or operations provided the established cost of any proposed special structure exceeds the sum of $20,000.00.

No operations or work authorized by a special-structure permit shall proceed beyond the limitations specified in any such permit.

SECTION 143

ALTERATION PERMITS

Scope of Alteration Permits

Par. 1430. Alteration permits shall be issued upon all alteration applications which have been properly filed and approved as provided by the provisions of this Code. Such permits shall cover and include all labor and materials necessary to perform any or all of the operations or work provided for in Paragraph 1330 of this Code.

Notice to Adjoining Owners

Par. 1431. Whenever any operation or work is done or performed under an alteration permit which requires any wall to be underpinned or whenever any part of jointly owned property is to be underpinned or otherwise altered, repaired or reconstructed, the applicant for a permit to perform such operation or do such work shall notify, in writing, the owner of such adjoining property or the joint-owner of such jointly owned property of the kind and nature of the operation or work proposed to be performed or done, and the Buildings Engineer shall not issue a permit to do such work unless and until he has been furnished with evidence satisfactory to him that the aforesaid written notice has been received by the persons entitled to receive such notice.

Posting Alteration Permits

Par. 1432. In all cases where an operation or work is being performed under an alteration permit, the poster or sign required by the provisions of Paragraph 1403 of this Code shall be conspicuously displayed upon that part of the site of such operation or work which is closest to a street or public highway, so that such said poster or sign shall be visible to the general public at all times.

Posters for alteration permits shall be light blue with black lettering.

Amending Alteration Permits

Par. 1436. Alteration permits shall not be amended except by the filing of a new and additional application with all necessary plans, drawings, specifications and other required data, upon which new and additional application and other data the Buildings Engineer shall issue a new permit, if said application and other data conform to the requirements of this Code, other ordinances or resolutions of the Mayor and City Council of Baltimore, and the laws of the State of Maryland. Such new permits shall not be issued, however, until the old permit which is being amended by the new permit has been surrendered and voided. Amendments, however, which, in the judgment of the Buildings Engineer, will only result in minor changes or alterations in the work or thing authorized to be done by an alteration permit, may be permitted by the Buildings Engineer without the necessity of filing and securing the approval of a new application. In the event of such amendments being permitted by the Buildings

Engineer without the filing of a new application, the amendments shall be made by proper notations placed by the Buildings Engineer on the original application and the original permit as well as on any and all approved drawings, plans, specifications and other data forming a part thereof. No alteration permit shall be amended or changed until after the Buildings Engineer has received in writing, on a form furnished by the Buildings Engineer, the consent of the owner of the property where any alteration operations or work are to be performed or done, to the requested amendment or change in any such permit.

Time Limitations of Alteration Permits

Par. 1437. After an alteration permit is issued, if the operation or work authorized and approved thereunder is not commenced within three months after the date of issue, such permit shall be null and void.

Partial or Temporary Alteration Permits

Par. 1438. No partial or temporary alteration permits shall be issued.

SECTION 144

RAZING AND MOVING PERMITS

Scope of Razing and Moving Permits

Par. 1440. Razing and moving permits shall be issued for the demolition, razing, moving or removing of all buildings for which razing or moving applications have been properly filed and approved as provided by the provisions of this Code.

Such permits shall cover and include all labor and equipment necessary to demolish or raze buildings or other structures, or move or remove buildings or other structures from one premises to another, including the lining up and setting to grade of any such moved building or other structure at its new location. These said permits shall also include the removal of all material, the cleaning up of the premises involved, the flashing of roofs where broken, the repairing of party walls, fences, and all other work incidental to the demolition or razing or moving or removing of buildings or other structures. No razing and moving permit, among other things, shall include grading or excavating or otherwise changing the physical condition of the land at the location to which the building is moved or removed, nor shall it include the foundation or substructure of the building or other structure which has been moved in its new location, nor shall it include reconstruction or restoration of the building or other structure so moved.

Notice to Adjoining Owners

Par. 1441. The applicant for a razing and moving permit shall notify the owners and occupants of all adjoining property in writing of the operation or work proposed to be performed or done under the requested razing and moving permit. A copy of such notification, together with evidence satisfactory to the Buildings Engineer that the notification has been received by said owners and occupants of the adjoining properties, shall be filed in the Bureau of Buildings before the permit is issued.

Posting Razing and Moving Permits

Par. 1442. In all cases where an operation or work is being performed under a razing and moving permit, the poster or sign required by the provisions of Paragraph 1403 of this Code shall be conspicuously displayed upon that part of the site of the operation or work which is closest to a street or public highway so that such said poster or sign shall be visible to the general public at all times.

Posters for razing and moving permits shall be red with black lettering.

Amending Razing and Moving Permits

Par. 1446. Razing and moving permits shall not be amended except by the filing of a new and additional application with all necessary plans, drawings, specifications, and other required data, upon which new and additional application and other data the Buildings Engineer shall issue a new permit, if said application and other data conform to the requirements of this Code, other ordinances or resolutions of the Mayor and City Council of Baltimore and the laws of the State of Maryland. Such new permits shall not be issued, however, until the old permit which is being amended by the new permit has been surrendered and voided. Amendments, however, which, in the judgment of the Buildings Engineer, will only result in minor changes or alterations in the work or thing authorized to be done by a razing and moving permit, may be permitted without the necessity of filing and securing the approval of a new application. In the event of such amendments being permitted by the Buildings Engineer without the filing of a new application, the amendments shall be made by proper notations placed by the Buildings Engineer on the original application and original permit as well as on any and all approved drawings, plans, specifications and other data forming a part thereof. No razing and moving permit shall be amended or changed until after the Buildings Engineer has received in writing, on a form furnished by the Buildings Engineer, the consent of the owner of the property to be razed, demolished, moved or removed, to the requested amendment or change in any such permit.

Time Limitations of Razing and Moving Permits

Par. 1447. Every razing and moving permit shall be null and void if the operation or work authorized thereby is not started within three months from the date of issue of such permit, and such permit shall remain in force only until the operation or work authorized thereby shall have been completed.

Partial Razing and Moving Permits

Par. 1448. No partial permit shall be issued for demolishing or razing or moving or removing any building or other structure.

SECTION 145

ELECTRICAL PERMITS

Scope of Electrical Permits

Par. 1450. Electrical permits shall be issued for electrical work for which electrical applications have been properly filed and approved as provided by the provisions of this Code. Such permits shall cover and include all materials, labor and equipment necessary to perform the operation or the work authorized by such permits to be done, including minor repairs to buildings or other structures incidental to the performance of such electrical work. Such permits shall also cover the construction of foundations upon which electrical equipment may be placed when any such foundations are not part of a building or other structure.

Notice to Adjoining Owners

Par. 1451. Whenever any application for an electrical permit indicates that any operation or work to be performed under such permit includes the installation or placing of motors, generators or other rotating or reciprocating electrical equipment exceeding 100 horsepower or 75 kilowatts, the applicant for such permit shall notify the owners and occupants of adjoining properties in writing of the operation or work that is proposed to be performed or done and the electrical equipment proposed to be installed under such electrical permit. A copy of such notification, together with evidence satisfactory to the Buildings Engineer that the notification has been received by the said owners and occupants of the adjoining properties, shall be filed in the Bureau of Buildings before any such permit is issued.

Posting Electrical Permits

Par. 1452. In all cases where an operation or work is being performed under an electrical permit, the poster or sign required by the provisions of Paragraph 1403 of this Code shall be conspicuously displayed upon that part of the site of the operation or work which is closest to a street or public highway, so that such said poster or sign shall be visible to the general public at all times.

Posters for electrical permits shall be yellow with black lettering.

Amending Electrical Permits

Par. 1456. Electrical permits shall not be amended except by the filing of a new and additional application with all necessary plans, drawings, specifications, and other required data, upon which new and additional application and other data the Buildings Engineer shall issue a new permit, if said application and other data conform to the requirements of this Code, other ordinances or resolutions of the Mayor and City Council of Baltimore and the laws of the State of Maryland. Such new permits shall not be issued, however, until the old permit which is being amended by the new permit has been surrendered and voided. Amendments, however, which, in the judgment of the Buildings Engineer, will only result in minor changes or alterations in the work or thing authorized to be done by an electrical permit, may be permitted without the necessity of filing and securing the approval of a new application. In the event of such amendments being permitted by the Buildings Engineer without the filing of a new application, the amendments shall be made by proper notations placed by the Buildings Engineer on the original application and original permit as well as on any and all approved drawings, plans, specifications and other data forming a part thereof. No electrical permit shall be amended or changed until after the Buildings Engineer has received in writing, on a form furnished by the Buildings Engineer, the consent of the owner of the proposed electrical operations or work to be done, to the requested amendment or change in any such permit.

Time Limitations of Electrical Permits

Par. 1457. Every electrical permit shall be null and void after the expiration of one year from the date of issue of such permit, unless the time for exercising such permit has been extended by the Buildings Engineer in writing on the permit originally issued.

Partial and Temporary Electrical Permits

Par. 1458. No partial permit shall be issued to perform any operation or work which may be performed under an electrical permit, but the Buildings Engineer, in his discretion, may issue a temporary permit to use a part or all of any electrical installation pending a final inspection of such electrical installation for the issuance of a certificate required by the provisions of this Code by the Buildings Engineer.

SECTION 146

MECHANICAL PERMITS

Scope of Mechanical Permits

Par. 1460. Mechanical permits shall be issued for all mechanical installations, operations, or work for which mechanical applications have been properly filed and approved, as provided by the provisions of this Code. Such permits shall cover and include all materials, labor and equipment necessary to perform the operations, mechanical installations or work authorized by such permits to be performed or done, including minor repairs to buildings or other structures incidental to the performance of such operations, mechanical installations or work. Such permits shall also cover the construction of foundations and supports upon which mechanical equipment may be placed when any such foundations or supports are not part of a building or other structure.

Notice to Adjoining Owners

Par. 1461. Whenever any application for a mechanical permit indicates that any operation or work to be performed under such permit includes the installation or placing of engines, printing presses or any other mechanical equipment exceeding 100 horsepower, or such mechanical equipment requires a prime mover for more than 100 horsepower to operate it, the applicant for such permit shall notify the owners and occupants of adjoining properties in writing of the operation or work that is proposed to be performed or done and the mechanical equipment proposed to be installed under such mechanical permit. A copy of such notification together with evidence satisfactory to the Buildings Engineer that the notification has been received by the said owners or occupants of the adjoining properties, shall be filed in the Bureau of Buildings before the permit is issued.

Posting Mechanical Permits

Par. 1462. In all cases where an operation or work is being performed under a mechanical permit, the poster or sign required by the provisions of Paragraph 1403 of this Code shall be conspicuously displayed upon that part of the site of the operation or work which is closest to a street or public highway, so that such said poster or sign shall be visible to the general public at all times.

Posters for mechanical permits shall be light green with black lettering.

Amending Mechanical Permits

Par. 1466. Mechanical permits shall not be amended except by the filing of a new and additional application with all necessary plans, drawings, specifications and other required data, upon which new and additional application and other data the Buildings Engineer shall issue a new permit, if said application and other data conform to the requirements of this Code, other ordinances or resolutions of the Mayor and City Council of Baltimore, and the laws of the State of Maryland. Such new permits shall not be issued, however, until the old permit which is being amended by the new permit has been surrendered and voided. Amendments, however, which, in the judgment of the Buildings Engineer, will only result in minor changes or alterations in the work or thing authorized to be done by a mechanical permit, may be permitted without the necessity of filing and securing the approval of a new application. In the event of such amendments being permitted by the Buildings Engineer without the filing of a new application, the amendments shall be made by proper notations placed by the Buildings Engineer on the original application and original permit as well as on any and all approved drawings, plans, specifications and other data forming a part thereof. No mechanical permit shall be amended or changed until after the Buildings Engineer has received in writing, on a form furnished by the Buildings Engineer, the consent of the owner of the proposed mechanical operations or work to be done, to the requested amendment or change in any such permit.

Time Limitations of Mechanical Permits

Par. 1467. Every mechanical permit shall be null and void after the expiration of one year from the date of issue of such permit, unless the time for exercising such permit has been extended by the Buildings Engineer in writing on the permit originally issued.

Partial and Temporary Mechanical Permits

Par. 1468. No partial permit shall be issued to perform any operation or work which may be performed under a mechanical permit, but the Buildings Engineer, in his discretion, may issue a temporary permit to use a part or all of any mechanical installation pending a final inspection of such mechanical installation for the issuance of a certificate required by the provisions of this Code by the Buildings Engineer.

SECTION 147

MINOR PRIVILEGE PERMITS

Issuance of Minor Privilege Permits

Par. 1470. Minor privilege permits may be granted by the Board of Estimates in accordance with the provisions of Section 47 entitled "Grants of Franchises", and Sub-Section (6) entitled "Bureau of Buildings" of Part I of Section 105 of the Charter.

SECTION 148

LICENSE PERMITS

Scope of License Permits

Par. 1480. License permits to use any land, building or other structure as a theatre, opera house, moving picture theater, dance hall, skating rink, auditorium, assembly hall, music hall, arena, stadium, or for any other use as a place of public assembly, or for any other use for which a license must be secured in accordance with the ordinances, resolutions or laws of the Mayor and City Council of Baltimore or the laws of the State of Maryland, shall be issued after inspection applications have been properly filed and approved as provided by the provisions of this Code.

Notice to Adjoining Owners

Par. 1481. If the use to be made of any land, building or other structure for which a license permit is required is such as may be a nuisance, or may cause a nuisance to be created, to the owners or occupants of the adjoining property, the applicant for such license permit shall, if requested by the Buildings Engineer, give notice in writing to said owners and occupants of adjoining property, of the use to be made of any land, building or structure as indicated in the application for such license permit. A copy of such notification, together with evidence satisfactory to the Buildings Engineer that the notification has been received by the said owners and occupants of the adjoining properties, shall be filed in the Bureau of Buildings before a license permit is issued.

Posting License Permits.

Par. 1482. No poster or sign, as required by Paragraph 1403 of this Code, shall be required to be posted in connection with the application for or the issuance of any license permit.

Amending License Permits

Par. 1486. No license permit shall be amended. Whenever any person who has a license permit desires to deviate from the license granted by such permit, he shall follow the same procedure required in securing such permit in the first instance, and before any new license permit shall be issued, the original permit shall be surrendered to the Buildings Engineer and voided by him.

Time Limitations of License Permits

Par. 1487. License permits shall remain in force only for the period of time stated on such license permit, and in no event shall any license permit be issued for a period of time in excess of one year.

Partial and Temporary License Permits

Par. 1488. No partial or temporary license permits shall be issued.

SECTION 149

MISCELLANEOUS PERMITS

Scope of Miscellaneous Permits

Par. 1490. Miscellaneous permits shall be issued upon all miscellaneous applications which are properly filed and approved, as provided by the provisions of this Code.

A miscellaneous permit, in any particular instance, shall cover the construction of miscellaneous structures, as defined in Chapter 49 of this Code; or the grading; excavating or otherwise altering the physical condition of land; or the paving or improving of the surface of land; or for any and all other operations or work of every kind or character provided for by the provisions of this Code or which is within the scope of this Code, but which is not within the scope of the other classes of permits provided for by this Code.

Notice to Adjoining Owners

Par. 1491. Whenever any operation or work proposed to be performed or done under a miscellaneous permit will encroach upon or in any way affect any adjoining property, the applicant for the permit shall notify the owners and occupants of such adjoining property in writing of the operation or work that is proposed to be performed or done. A copy of such notification, together with evidence satisfactory to the Buildings Engineer, that the notification has been received by said owners and occupants of the adjoining properties, shall be filed in the Bureau of Buildings before the permit is issued.

Notices of proposed underpinning of adjoining property and notices of excavations or other changes in the physical condition of the land shall be given as required in Paragraph 1431 of this Code.

Posting Miscellaneous Permits

Par. 1495. No poster or sign, as required by the provisions of Paragraph 1403 of this Code, shall be required to be posted in connection with the application for or the issuance of any miscellaneous permit.

Amending Miscellaneous Permits

Par. 1496. Miscellaneous permits shall not be amended except by the filing of a new and additional application with all necessary plans, drawings, specifications, and other required data, upon which new and additional application and other data the Buildings Engineer shall issue a new permit, if said application and other data conform to the requirements of this Code, other ordinances or resolutions of the Mayor and City Council of Baltimore, and the laws of the State of Maryland. Such new permits shall not be issued, however, until the old permit which is being amended by the new permit has been surrendered and voided. Amendments, however, which, in the judgment of the Buildings Engineer, will only result in minor changes or alterations in the work or thing authorized to be done by a miscellaneous permit, may be permitted without the necessity of filing and securing the approval of a new application. In the event of such amendments being permitted by the Buildings Engineer without the filing of a new application, the amendments shall be made by proper notations placed by the Buildings Engineer on the original application and original permit as well as on any and all approved drawings, plans, specifications and other data forming a part thereof. No miscellaneous permit shall be amended or changed until after the Buildings Engineer has received in writing, on a form furnished by the Buildings Engineer, the consent of the owner of the property on which the proposed operations or work are to be performed or done, to the requested amendment or change in any such permit.

Time Limitations of Miscellaneous Permits

Par. 1497. Miscellaneous permits shall remain in force only for the period of time stated on such permit, and in no event shall any miscellaneous permit be issued for a period of time in excess of one year.

Partial and Temporary Miscellaneous Permits

Par. 1498. No partial or temporary miscellaneous permit shall be issued, unless the issuance thereof is properly approved by the Buildings Engineer, and only in that event may a partial or temporary miscellaneous permit be issued.

CHAPTER 15

CERTIFICATES

Sec. 150—General Requirements for Certificates.
Sec. 151—General Certificates.
Sec. 152—Building Certificates.
Sec. 156—Electrical Certificates.
Sec. 157—Mechanical Certificates.
Sec. 158—Minor Privilege Certificates.
Sec. 159—Miscellaneous Certificates.

SECTION 150

GENERAL REQUIREMENTS FOR CERTIFICATES

Purpose of Certificates

Par. 1500. Certificates issued by the Buildings Engineer, as provided for by the provisions of this Code, shall establish the status of any and all land, buildings and other structures as to use, occupancy, type of construction, and any and all other matters relating thereto; and such certificates shall also certify that any particular electrical, mechanical, or other similar operation or work, has been performed, done, erected or installed in accordance with the provisions of this Code. The issuance of any such certificate, however, shall not be construed or taken to be a guarantee or representation of any kind or character that any operation or work performed or done has been performed or done perfectly. The Mayor and City Council of Baltimore shall not be legally liable for any error or mistake which may be contained in any such certificate issued, and no one shall have a right of action, either at law or in equity, against the Mayor and City Council of Baltimore, its agents or employees, as a result of or in connection with any error or mistake which may be contained in any such certificate.

Certificates shall be issued on special forms provided by the Bureau of Buildings and in no event shall any permit of whatsoever kind be construed or taken to be a certificate to be issued in accordance with the provisions of this Code.

Classification of Certificates

Par. 1501 Certificates shall be classified as follows:

General Certificates
Building Certificates

Electrical Certificates
Mechanical Certificates
Minor Privilege Certificates
Miscellaneous Certificates

Inspections for Certificates

Par. 1502. Before the Buildings Engineer shall issue any certificate, any and all inspections required by Chapter 16 of this Code shall be made.

Issuance of Certificates

Par. 1503. Whenever, by the provisions of this Code, the Buildings Engineer shall be required to issue certificates, such certificates shall be issued only after any and all operations or work authorized to be performed or done under a properly issued permit shall be completed to the satisfaction of the Buildings Engineer and in accordance with the provisions of this Code.

In all cases where the issuance of a certificate by the Buildings Engineer is not required by the provisions of this Code, a proper certificate shall be issued by the Buildings Engineer upon the written request of any person, firm or corporation entitled to receive the same.

Amending Certificates

Par. 1504. Any certificate issued by the Buildings Engineer may be amended or otherwise changed by the Buildings Engineer, if it is proper to make such amendment or change, upon the receipt of a written request to the Buildings Engineer from any person, firm or corporation entitled to have such certificate properly amended or changed, and such proper amendment or change shall be effected by the surrender of the old certificate and the issuance of a new certificate. No new certificates shall be issued without the old certificate being first surrendered and canceled.

Duplicate and Additional Certificates

Par. 1506. No duplicate certificates shall be issued, but additional copies of properly issued certificates may be issued at the request of any one entitled to receive the same, provided the number of additional copies of certificates so issued shall be stated upon the original issued certificate. Such additional copies of certificates shall be issued only upon the payment of the fee required for each certificate as provided in Section 178 of this Code.

Record of Certificates

Par. 1507. A complete record of all certificates issued by the Buildings Engineer shall be kept in the Bureau of Buildings in accordance with the requirements of Paragraph 1884 of this Code.

Disputed Certificates

Par. 1508. In the event that a dispute should arise in connection with any certificate, or the issuance of any certificate or the contents of any certificate that has been or may be issued by the Buildings Engineer, any aggrieved party to such dispute may refer the matter to the Board of Arbitration, as provided by the provisions of Section 194 of this Code.

Violation of Certificates

Par. 1509. The use or occupancy of any land, building or other structure, or the performance of any operation or the doing of any work, act or thing by anyone, for which a certificate should first be obtained from the Buildings Engineer, without first having secured a proper certificate, shall constitute a violation of this Code and shall be subject to the penalties provided in Paragraph 1926 of this Code.

SECTION 151

GENERAL CERTIFICATES

Scope of General Certificates

Par. 1510. General certificates shall be certificates issued by the Buildings Engineer in accordance with and pursuant to the terms and provisions of Paragraph 1221 of this Code, and such certificates shall cover any or all of the matters and things provided for in said Paragraph 1221.

Form of General Certificates

Par. 1511. All general certificates shall be on printed forms, 8½ inches by 11 inches in size, provided by the Buildings Engineer, and such certificates shall contain all information and data pertinent to or concerning the subject matter involved and which has been approved, including the names and addresses of all parties concerned.

Temporary General Certificates

Par. 1516. No temporary general certificate shall be isused.

Transfer of General Certificates

Par. 1518. General certificates may be transferred or assigned by the holder thereof to another person by proper endorsement on such certificates to that effect and after proper written notice concerning such transfer or assignment has been filed in the Bureau of Buildings, if no changes in the subject matter of any such certificates have been made.

Voiding General Certificates

Par. 1519. Every general certificates shall be null and void if any change or alteration is made in the subject matter originally covered by any such certificate or if the holder of any such certificate fails to strictly comply with any and all of the provisions or conditions of such certificate.

SECTION 152

BUILDING CERTIFICATES

Scope of Building Certificates

Par. 1520. Building certificates shall establish, the use and occupancy to which any land may be put; the use and occupancy to which any building or other structure may be put; the type of construction authorized to be used in the construction or erection of any building or other structure; and the floor loads of any building or other structure. Building certificates shall also certify that the established use, occupancy, type of construction used or floor loads comply with the requirements of this Code, except as otherwise specifically set forth in such certificates.

Form of Building Certificates

Par. 1521. Every building certificate shall be on durable paper, 8½ inches by 11 inches in size, and shall contain the following information pertaining to the land, building or other structure concerned:

1. The location of the land, building or other structure.
2. The name and address of the owner.

3. The occupancy classification.
4. The type of construction.
5. The safe live loads for the floors.
6. Record of electrical and mechanical equipment.
7. General remarks (variations and exceptions).
8. Conditions upon which certificate is issued.
9. Such other information or data as the Buildings Engineer may deem advisable.

Required Building Certificates

Par. 1522. The owner of all lands, buildings or other structures, except special structures as provided for in Sections 491 to 499, inclusive, of this Code, shall secure from the Buildings Engineer a building certificate in any and all of the following cases:

1. For every new building or other structure, a certificate certifying that such building or other structure complies with the provisions of this Code.

2. For every addition to an existing building or other structure where such addition exceeds 100 square feet or one story in height, a certificate certifying that such addition complies with the provisions of this Code. Such certificate shall also indicate in what respects the said existing building or other structure to which the addition is being made either complies or fails to comply with the provisions of this Code.

3. For every existing building or other structure which may be reconstructed, altered or changed, a certificate certifying that all operations or work performed or done, including materials used therein, in connection with such reconstruction, alteration or change, complies with the provisions of this Code. Such certificate shall also indicate in what respects the other portions of the said existing building or other structure being reconstructed, altered or changed either comply or fail to comply with the provisions of this Code.

4. For all lands, buildings or other structures in which there is a change in use or occupancy, or a change in the class of occupancy, a certificate certifying in what respects such lands, buildings or other structures comply or fail to comply with the provisions of this Code.

In all of the above mentioned cases, if the provisions of this Code have been complied with, the Buildings Engineer shall issue the proper building certificates to the owners of the lands, buildings or other structures concerned.

Requested Building Certificates

Par. 1523. Building certificates shall be issued upon the request of the owner or his agent or other legal representative, of any lands, buildings or other structures, for all lands, buildings or other structures that conform to the requirements of this Code; and such certificates shall also be issued, if the Buildings Engineer deems it advisable, for those lands, buildings or other structures which do not conform to the requirements of this Code, but in all such cases, the certificates issued shall specifically set forth those particulars in which the land, building or other structure either conforms or fails to conform to the requirements of this Code.

Partial Building Certificates

Par. 1525. Partial building certificates may be issued to use a portion of a building or other structure which may have been completed and is ready for occupancy prior to the completion of other portions of such building or other structure. Such partial certificates shall remain in force only until a building certificate is issued for the entire building.

Temporary Building Certificates

Par. 1526. Temporary building certificates may be issued to occupy an existing building temporarily or a new building when it is practical to occupy the same. No temporary certificate shall be issued for a period of more than one year.

Transfer of Building Certificates

Par. 1528. Building certificates may be transferred or assigned by the holder thereof to another person by proper endorsement on such certificates to that effect, if no changes in the subject matter of any such certificates have been made and if written approval concerning such transfer or assignment has been first obtained from the Buildings Engineer.

Voiding Building Certificates

Par. 1529. Every building certificate shall be null and void, if any change or alteration is made in the use or occupancy of the land, building or other structure, or upon the adding to, reconstruction, alteration, change, demolition or removal of the building or other structure, upon which any such certificate has been issued.

SECTION 156

ELECTRICAL CERTIFICATES

Scope of Electrical Certificates

Par. 1560. Electrical certificates shall certify that any particular electrical operation or work has been performed or done, or that any particular electrical equipment has been erected or installed, in accordance with the provisions of this Code.

Form of Electrical Certificates

Par. 1561. Every electrical certificate shall be issued on forms and in such manner as the Buildings Engineer may direct, and such certificate shall contain the names and addresses of all parties concerned and a general description of the operation or work performed or done or the electrical equipment erected or installed which has been completed and approved by the Buildings Engineer.

Required Electrical Certificates

Par. 1562. Electrical certificates shall be issued and secured before an electric meter is installed on any land or in any building or other structure, and before electric service is connected on any land or in any building or other structure. From and after the effective date of this Code it shall be unlawful for any public service corporation to operate any electrical service to any land, building or other structure unless and until after an electrical certificate has been issued and secured therefor, provided, however, that no electrical certificate shall be required to supply temporary electric service in connection with any building or construction operation or work, if such temporary electric service is terminated at the conclusion of any such building or construction operation or work; otherwise, the usual electrical certificate shall be first obtained.

Requested Electrical Certificates

Par. 1563. Electrical certificates shall be issued upon the request of the owner of any land, building or other structure or electrical equipment, or his duly authorized representative, for existing electrical work that conforms to the requirements of this Code.

Temporary and Partial Electrical Certificates

Par. 1566. At the discretion of the Buildings Engineer, temporary electrical certificates may be issued to permit the connection of electric service pending the final completion of any operation or work, and partial electrical certificates may be issued to permit a portion of an electrical project to be put in service before the entire electrical project is completed.

No temporary or partial electrical certificate shall be issued for a period in excess of one year.

Transfer of Electrical Certificates

Par. 1568. Electrical certificates shall not be transferred.

Voiding Electrical Certificates

Par. 1569. All electrical certificates shall be null and void, if any change or alteration is made in the use or occupancy of the land, building or other structure or electrical equipment, or upon the adding to, reconstruction, alteration, change, demolition or removal of the building or other structure or electrical equipment upon which any such certificate has been issued.

SECTION 157

MECHANICAL CERTIFICATES

Scope of Mechanical Certificates

Par. 1570. Mechanical certificates shall certify that any particular mechanical operation or work has been performed or done or that any particular mechanical equipment has been erected or installed in accordance with the provisions of this Code. These certificates shall also include certificates on all periodic inspections that are required to be made by Section 162 of this Code.

Form of Mechanical Certificates

Par. 1571. Every mechanical certificate shall be issued on forms and in such manner as the Buildings Engineer may direct, and such certificate shall contain the names and addresses of all parties concerned and a general description of the operation or work performed or done or the mechanical equipment erected or installed which has been completed and approved by the Buildings Engineer.

Registration of Mechanical Equipment

Par. 1572. Every registered elevator, hoist, conveyor or power boiler, which has been heretofore or which may hereafter be installed or erected, shall be registered in the Bureau of Buildings on forms provided for that purpose by the Buildings Engineer.

Certificates for Registered Mechanical Equipment

Par. 1573. Before any mechanical equipment required by the provisions of this Code to be registered in the Bureau of Buildings is used or operated, the owner of such mechanical equipment shall secure, and the Buildings Engineer shall issue, a proper mechanical certificate.

Mechanical certificates shall be issued for all existing power boilers which have been heretofore erected or installed and registered with the State Boiler Inspector of the State of Maryland, upon the presentation to the Buildings Engineer of evidence satisfactory to him that any such power boiler has been properly registered with the aforesaid State agency.

Mechanical certificates for all mechanical equipment registered with the Bureau of Buildings shall be renewed annually upon the payment of the fee provided for in Paragraph 1788 of this Code for the renewal of such certificates.

Mechanical Certificates for Installations

Par. 1574. Mechanical certificates shall be issued upon the request of the owner or his agent or other legal representative of any mechanical equipment that conforms to the requirements of this Code; and such certificates shall also be issued if the Buildings Engineer deems it advisable for mechanical equipment which does not conform to the requirements of this Code; but in all such cases, the certificates issued shall specifically set forth those particulars in which such mechanical equipment either conforms or fails to conform to the requirements of this Code.

Temporary and Partial Mechanical Certificates

Par. 1576. At the discretion of the Buildings Engineer, temporary mechanical certificates may be issued to permit the operation of properly installed or erected mechanical equipment pending the final completion or final inspection of such mechanical equipment, and partial mechanical certificates may be issued to permit a portion of a mechanical project to be put in service before the entire mechanical project is completed.

No temporary or partial mechanical certificate shall be issued for a period in excess of one year.

Posting Mechanical Certificates

Par. 1577. All mechanical certificates pertaining to registered mechanical equipment shall be posted in a conspicuous place satisfactory to the Buildings Engineer in, on or near such mechanical equipment, and such mechanical certificate shall be protected by glass set in a frame. All other mechanical certificates need not be posted unless specifically required to be posted by the Buildings Engineer, who shall, in any and all such cases, designate the place of posting.

Transfer of Mechanical Certificates

Par. 1578. Mechanical certificates shall not be transferred.

Voiding Mechanical Certificates

Par. 1579. In the event that any mechanical equipment covered by a mechanical certificate is caused to vary from any of the requirements of this Code by reason of any change made either in the use or occupancy of any land, building or other structure, or in the building or other structure itself, in or on which such mechanical equipment has been erected or installed, then such mechanical certificate shall be null and void. In addition to the aforegoing, if any change or alteration is made in any mechanical equipment covered by a mechanical certificate, then, in that event, such mechanical certificate shall be also null and void.

SECTION 159

MISCELLANEOUS CERTIFICATES

Scope of Miscellaneous Certificates

Par. 1590. Miscellaneous certificates shall certify that any particular act, thing, operation or work has been performed or done in accordance with the provisions of this Code in all cases where any such act, thing, operation or work is not covered by any of the kinds or types of certificates specifically required by, but not provided for, in this Code.

Form of Miscellaneous Certificates

Par. 1591. All miscellaneous certificates shall be issued in such form and in such manner as the Buildings Engineer may direct, and such certificates shall contain the names and addresses of all parties concerned, and a general description of the act, thing, operation or work which has been completed and approved by the Buildings Engineer.

Requested Miscellaneous Certificates

Par. 1593. Miscellaneous certificates shall be issued upon the request of the owner, lessee or manufacturer of any land, building or other structure, equipment, materials or things, or his duly authorized representative, or upon the request of any one else who may be properly entitled to receive such a certificate, if the matter or thing involved in any such request conforms to the requirements of this Code.

Temporary and Partial Miscellaneous Certificates

Par. 1596. No temporary or partial miscellaneous certificates shall be issued.

Posting Miscellaneous Certificates

Par. 1597. Unless specifically ordered by the Buildings Engineer, miscellaneous certificates shall not be required to be posted.

Transfer of Miscellaneous Certificates

Par. 1598. Miscellaneous certificates may be transferred or assigned by the holder thereof to another person by proper endorsement on such certificates to that effect, if no changes in the subject matter of any such certificates have been made and if written approval concerning such transfer or assignment has been first obtained from the Buildings Engineer.

Voiding Miscellaneous Certificates

Par. 1599. All miscellaneous certificates shall be null and void if any change or alteration is made in the subject matter of such certificates or if any or all of the conditions upon which such certificates may have been issued are not complied with.

CHAPTER 16

INSPECTIONS AND TESTS

Sec. 160—General Requirements for Inspections and Tests.
Sec. 161—General Rules for Inspections and Tests.
Sec. 162—Required Periodic Inspections.
Sec. 163—Routine Inspections.
Sec. 164—Inspections of Construction.
Sec. 165—Electrical Inspections.
Sec. 166—Mechanical Inspections.
Sec. 167—Inspections and Tests of Materials.
Sec. 168—Inspections and Tests of New Materials and Construction.
Sec. 169—Miscellaneous Inspections and Tests.

SECTION 160

GENERAL REQUIREMENTS FOR INSPECTIONS AND TESTS

Scope of Inspections and Tests

Par. 1600. Inspections and tests shall include any and all inspections, examinations, tests and investigations of any and all land, buildings or other structures, or any and all parts thereof, or of any and all materials, types or kinds of methods of construction, machinery, appliances, accessories or equipment therein or thereon, as well as any matter or thing pertaining or relating to any of the aforegoing to determine if any or all of the aforesaid conform to the requirement of this Code.

Classification of Inspections and Tests

Par. 1601. Inspections and tests are divided into the following classes:

a. Periodic Inspections.
b. Routine Inspections of Existing Structures.
c. Inspections of New Construction.
d. Electrical Inspections.
e. Mechanical Inspections.
f. Inspections and Tests of Newly Developed Materials or Construction.
g. Miscellaneous Inspections and Tests.

Inspections and Tests by Other Bureaus and Departments

Par. 1605. Where inspections or tests are made by qaulified and competent employees of a Bureau or Department of the Mayor and City Council of Baltimore, other than the Bureau of Buildings, in particular cases, the Buildings Engineer, at his discretion, may adopt the findings of such inspections or tests as his own, in lieu of conducting a separate and independent investigation or test in any of such cases.

Inspections and Tests by Authorized Agencies

Par. 1606. Inspections and test, by authorized agencies, of special or complex construction, operations, equipment, foundations, structural steel, reinforced concrete, steam boilers, elevators, fuel-burning equipment and any other electrical or mechanical work may be permitted by the Buildings Engineer, subject to the conditions of Section 124 of this Code.

All reports pertaining to any such inspections and tests shall be signed in full by the person or persons who make such inspections or tests.

No certificates required to be issued by the Buildings Engineer shall be issued or based on any such inspections or tests, unless the written reports made in connection with such inspections or tests, are sworn to before a notary public by the persons signing such reports, and definitely certify that the subject matter of such inspections or tests comply with the provisions of this Code.

No person making such inspections or tests shall be interested, directly or indirectly, in the building, structure, construction, operation, equipment, material, matter or thing inspected or tested.

Tests Made by Recognized Laboratories

Par. 1607. The findings of any and all inspections or tests made by laboratories or other investigating agencies, of recognized standing and approved by the Buildings Engineer, may be adopted by the Buildings Engineer as his own, in accordance with Section 124 of this Code, and certificates to use materials or new or unusual methods of construction which are safe and in accordance with good engineering practice and in accordance with the spirit of this Code, although not in accordance with the strict letter of the requirements of this Code, may be issued upon such findings.

Penalties for Obstructing Inspection

Par. 1609. Every person, firm or corporation, who refuses to allow any inspections or tests, required by the provisions of this Code, to be made; or, when required by the provisions of this Code, who refuses to supply or furnish the necessary and proper means for making any inspections or tests required by the provisions of this Code; or who does or omits to do any act or thing, to obstruct or prevent the conducting of proper inspections or tests, or who fails to promptly obey any instructions or orders given by the Buildings Engineer in connection with any inspections or tests required by the provisions of this Code to be made, shall be guilty of a violation of the provisions of this Code, and shall be subject to the penalties provided for a violation of the Administrative Regulations of this Code.

SECTION 161

GENERAL RULES FOR INSPECTIONS AND TESTS

Authority of Inspectors

Par. 1610. The Buildings Engineer is hereby empowered to authorize such employees of the Bureau of Buildings as he may deem necessary and proper to make any and all inspections and tests provided for by the provisions of this Code, or to enforce any and all other provisions of this Code.

Removal of Covering to Make Inspections

Par. 1615. The Buildings Engineer shall have full power and authority to remove or cause to be removed any obstruction or covering which interferes with the complete inspection of any operation or work, including materials, being performed or done under any permit issued by the Buildings Engineer. Any and all costs and expenses incurred in connection with the removal of any such obstruction or covering shall be paid by the owner, or the person performing, such operation or work.

Inspection at the Request of Owner

Par. 1616. Whenever the owner, lessee, occupant, or the duly authorized agent of any of the aforegoing, of a building or other structure, requests that an inspection be made of such building or other structure to determine the safety of such building or other structure, the person requesting such inspection, at his sole cost and expense, shall furnish to the Bureau of Buildings a survey report of such building or other structure made by a qualified and competent engineer or architect, all drawings and plans of such building or other structure, and any and all other information which may be necessary to enable the Buildings Engineer to determine the safety of such building or other structure. After all of the above has been furnished and the Buildings Engineer shall have made the required inspection, the Buildings Engineer shall issue a proper certificate setting forth therein the purpose for, and the conditions under, which the building or other structure may be used.

Failure to Pass Inspections and Tests

Par. 1618. Every building, structure, material, type or kind of method of construction, machine, appliance, accessory or equipment which, when inspected or tested, fails to comply with the requirements of this Code, shall be disapproved, and no new inspection or test shall be made until and after any and all necessary corrections or improvements have been made in the matter or thing inspected or tested.

Inspections of Operating Conditions

Par. 1619. Inspections of the maintenance and operation of any and all buildings and other structures for every class of occupancy shall be made upon complaint and when required by the provisions of Section 162 of this Code.

SECTION 162

REQUIRED PERIODIC INSPECTIONS

Scope of Periodic Inspections

Par. 1620. Periodic inspections shall include any and all inspections required by the provisions of this Code, other ordinances or resolutions of the Mayor and City Council of Baltimore, or the laws of the State of Maryland, to be made at fixed stated intervals whether specifically mentioned in this Section or not.

Periodic inspections shall be made independent of any routine or other inspections required by the provisions of this Code to be made.

Inspections Every Four Years

Par. 1621. Once every four years, the exits, electric wiring, pressure tanks of hydraulic elevators, fire extinguishing appliances, and general maintenance and operating conditions shall be inspected in every public and private school, hospital, asylum and infirmary located in the City of Baltimore.

Such inspections shall include all tests necessary to establish whether such equipment or appliances are in safe operating condition.

Inspections Every Two Years

Par. 1622. Once every two years there shall be inspected the maintenance and operating conditions of, every refrigerating plant of Class A, B and C using Group V refrigerants, Class A and B using Group IV refrigerants, and Class A using Group III refrigerants, as classified in Chapter 96 of this Code, and of every tower and every tank, sign or other structure supported on towers in the City of Baltimore.

Such inspections shall include all tests necessary to establish whether such equipment or appliances are in safe operating condition.

Annual Inspections

Par. 1623. The exits, electric wiring, fire extinguishing appliances, and the general maintenance and operating conditions in and of theaters, moving picture theaters, assembly halls, dance halls, amusement devices, and other places of public assembly requiring a license permit as provided in Paragraph 1480 of this Code, shall be inspected once each year.

Every power boiler shall be inspected once every year. Unfired pressure vessels shall be inspected as and when required in Paragraph 9374.

The maintenance and operating conditions of every hazardous commercial or industrial building shall be inspected once every year.

Such inspections shall include all tests necessary to establish whether such equipment or appliances are in safe operating condition.

Semi-Annual Inspections

Par. 1624. Every freight elevator, conveyor, crane, sidewalk lift and similar equipment for conveying freight or material from one level or place to another, which has been registered, shall be inspected twice each year, and no period of time longer than eight months shall elapse between any two successive inspections.

Such inspections shall include all tests necessary to establish whether such equipment or appliances are in safe operating condition.

Inspections Three Times Each Year

Par. 1625. Every registered passenger elevator, personal elevator, escalator, and similar equipment, shall be inspected three times each year and no period of time longer than five months shall elapse between any two successive inspections.

Such inspections shall include all tests necessary to establish whether such equipment or appliances are in safe operating condition.

SECTION 163

ROUTINE INSPECTIONS

Scope of Routine Inspections

Par. 1630. Routine inspections shall include any and all inspections required to be made by the provisions of this Code in connection with the following matters:

1. Inspections made during the performance of any operation or work being performed or done under a permit required by the provisions of this Code.
2. Before the issuance of any permit or certificate.
3. All reported dangerous and unsafe buildings and other structures.
4. All reported accidents in which a building or other structure, or the equipment therein, is involved.
5. All reported construction failures.
6. Complaints of every nature involving violations of this Code.
7. Other miscellaneous matters.

Routine Inspections During Construction

Par. 1631. During the time that any operation or work is being performed or done under a duly issued permit, any and all inspections required by the provisions of Chapter 16 of this Code shall be made.

Routine Inspections for Permits

Par. 1632. Whenever it shall be necessary that any inspection be made by the Buildings Engineer in connection with the issuance of any permit, such inspection shall be made prior to the issuance of any such permit.

Routine Inspections for Certificates

Par. 1633. Upon the completion of every new building or other structure, a complete, thorough and final inspection shall be made before a building certificate is issued.

Before a building certificate is issued for any existing building or other structure, a complete and thorough inspection shall be made.

Routine Inspections of Unsafe Buildings

Par. 1634. Upon the receipt of information by the Buildings Engineer that any building, structure or premise is unsafe or dangerous, an inspection thereof shall be made immediately.

Routine Inspections of Accidents and Failures

Par. 1635. An inspection shall be made immediately, upon the receipt of information by the Buildings Engineer, of every accident occurring in any building or other structure, and of each failure or collapse of a building or other structure, or any part thereof, or any equipment therein.

Routine Inspections on Complaints

Par. 1637. An inspection shall be made of any building, structure or premise upon the receipt of information by the Buildings Engineer that any provisions of this Code is being violated.

Miscellaneous Routine Inspections

Par. 1639. All inspections of a nature not specifically herein provided for shall be made as directed by the Buildings Engineer.

SECTION 164

INSPECTIONS AND TESTS OF CONSTRUCTION

Scope of Inspections and Tests of Construction

Par. 1640. Inspections and tests of construction shall include any and all examinations and any and all inspections or tests which may be made during the time any building or other structure is being constructed, reconstructed, repaired, added to, altered, razed, demolished, moved or removed. Such inspections or tests shall also include the examination, inspection or test of foundations, materials and methods of construction.

Inspections and Tests of Construction by Other Agencies

Par. 1642. When inspections or tests required by the provisions of this Code of any construction operation or work relating thereto are made by agencies other than the Bureau of Buildings, such inspections or tests shall be entirely under the supervision of the Buildings Engineer, and the costs of any and all such inspections or tests shall be borne by the owner of such construction operation or work relating thereto.

Required Inspections and Tests of Construction

Par. 1645. After permits are issued for constructing, reconstructing, adding to, altering, razing, demolishing, moving or removing any buildings or other structures, such inspections and tests shall be made as may be necessary to insure that any and all operations or work covered by such permits are being performed or done in conformity with all of the provisions of this Code.

Inspections and Tests of Materials and Construction

Par. 1646. If at any time while any construction operation or work relating thereto is being performed or done, the Buildings Engineer is of the opinion that any materials or methods of construction do not comply with the provisions of this Code, the Buildings Engineer is hereby authorized to inspect or test any such materials or methods of construction for the purpose of determining whether or not such materials or methods of construction comply with the provisions of this Code.

Inspections and Tests Before Work Is Concealed

Par. 1647. No foundations, footings, wall construction, bracing, fire stopping, chimneys, ducts, pipe conduits or any other construction shall be concealed until such operation or work has been approved by the Buildings Engineer or his authorized representative.

When the inspection of such construction operations or work is requested by the person in charge thereof, the Buildings Engineer shall make such inspection before noon of the working day following the day on which the request was made.

SECTION 165

ELECTRICAL INSPECTIONS AND TESTS

Scope of Electrical Inspections and Tests

Par. 1650. Electrical inspections and tests shall include any and all inspections, examinations, tests and other investigations of the design, construction, installation, alteration or repair of motors, transformers, wiring and all other similar electrical work relating or pertaining to wiring, equipment or appliances.

Periodic Electrical Inspections and Tests

Par. 1651. Periodic inspections and tests of electrical work shall be made as required in Section 162 of this Code.

Testing of Electrical Equipment

Par. 1652. Tests of electrical equipment shall be made at any time when, in the opinion of the Buildings Engineer, such tests are necessary to determine whether or not such equipment complies with the provisions of this Code.

Inspection Before Supplying Current

Par. 1656. No system of electrical wiring shall be energized before inspection and approval by the Buildings Engineer or his duly authorized representative.

Reinspection of Electrical Work

Par. 1658. The Buildings Engineer shall make or cause to be made reinspections of any electric wiring, installations, equipment or appliances of any kind whatsoever at any time he may deem it necessary to protect the public safety.

SECTION 166

MECHANICAL INSPECTIONS AND TESTS

Scope of Mechanical Inspections

Par. 1660. Mechanical inspections shall include any and all examinations, inspections, investigations or tests of any and all mechanical equipment, installations, operations or work, or anything relating thereto.

Reinspections of Mechanical Work

Par. 1661. The Buildings Engineer shall make or cause to be made reinspections of any mechanical equipment, installations, operations or work, or anything relating thereto, at any time he may deem it necessary to protect the public safety.

Inspections and Tests of Elevators and Hoists

Par. 1662. Every new elevator, hoist, lift, escalator, dumbwaiter, personal service elevator, or similar equipment shall be inspected and tested before it is put in service in accordance with Chapter 91 of this Code.

Inspections and Tests of Power Machinery

Par. 1663. All power machinery shall be inspected when installed and, where certificates of installation are desired, such machinery shall also be tested for safety of operation before the issuance of the certificate.

Inspections and Tests of Power Boilers

Par. 1664. Power boilers and unfired pressure vessels shall be inspected and tested as required in Section 937 of this Code.

Inspections of existing power boilers shall be made periodically as required in Paragraph 1623 of this Code.

Inspections and Tests of Furnaces and Fuel-Burning Systems

Par. 1665. Every furnace and every fuel-burning system shall be inspected and tested for safety of operation at the time of installation and no such equipment shall be put in service until after all requirements of this Code for design, construction, and installation of such equipment have been fully complied with.

Every piping system for fuel gases or liquids shall be inspected and tested for safety at the time of installation or extension. Whenever any such system has been out of service for more than one year, such system shall be inspected and tested before again being placed in service.

Inspections and Tests of Heating and Ventilating Systems

Par. 1666. Every heating and ventilating system shall be inspected and the necessary tests made at the time of installation, extension or alteration of any such system, and no such system shall be placed in service until after all requirements of this Code for design, construction and installation of such system have been fully complied with.

Any existing heating or ventilating system may be inspected or tested at any time that the Buildings Engineer may deem it necessary in order to protect the public safety or health.

Inspections and Tests of Refrigerating Systems

Par. 1667. Every refrigerating system for which permits are required shall be inspected at the time of installation, and tested at the same time if and as required in Paragraph 9682, and no such equipment shall be placed in service until after it has been approved by the Buildings Engineer. In the event that any refrigerating system is altered or extended, such system shall be inspected and the necessary tests made after such alteration or extension, and before such system is again placed in service.

Any existing refrigerating system may be inspected or tested at any time that the Buildings Engineer may deem it necessary in order to protect the public safety or health.

Inspections and Tests of Fire Extinguishing Appliances

Par. 1668. All fire-extinguishing appliances required by this Code shall be inspected and tested as required in Chapter 98 under the supervision of the Chief Engineer of the Fire Department of Baltimore City and the Buildings Engineer at the time of installation, and no such appliance shall be placed in service until after it has been approved by the said Chief Engineer of the Fire Department and the Buildings Engineer. In the event that any fire-exinguishing appliance required by this Code is altered or extended, such appliance, in the discretion of the Chief Engineer of the Fire Department and the Buildings Engineer, shall be inspected and tested after such alteration and extension and before such appliance is again placed in service.

All existing fire-exinguishing appliances required by this Code shall be inspected or tested at any time that the Chief Engineer of the Fire Department may deem it necessary in order to protect the public safety or health.

Inspections and Tests of Tanks

Par. 1669. Every tank, including its piping system, shall be inspected and tested for safety of operation at the time of installation, erection, extension or alteration, and no tank or piping system shall be placed in service until after all requirements of this Code for design, construction and installation of any such tank or piping system have been fully complied with.

Portable tanks which have been properly inspected and tested by the manufacturer thereof, or by an approved inspection or testing agency, need not be tested by the Buildings Engineer at the time of installation or erection.

Every existing tank or its piping system, except tanks requiring periodic inspections, may be inspected or tested at any time that the Buildings Engineer may deem it necessary in order to protect the public safety or health.

SECTION 167

INSPECTIONS AND TESTS OF MATERIALS

Scope of Inspections and Tests of Materials

Par. 1670. The inspections and tests of any or all materials or products provided for in Paragraph 1671 of this Code shall include any and all examinations, inspections, investigations, tests, or other procedures, that may be necessary to determine whether or not any materials or products used or proposed to be used in any building or other structure comply with the provisions of this Code.

Inspections and Tests of Building Materials

Par. 1671. Before any or all building materials or products are used in any building or other structure, such materials or products shall be inspected and tested by the Buildings

Engineer, at his discretion, to determine whether or not any or all of such building materials or products comply with the provisions of this Code.

SECTION 168

INSPECTIONS AND TESTS OF NEW MATERIALS AND CONSTRUCTION

Fire Tests of Materials and Construction

Par. 1681. Fire tests of materials, products or construction shall be made in accordance with the "Standard Specification for Fire Tests of Building Construction and Materials" of the American Society for Testing Materials, Serial Designation C19-33, by the National Bureau of Standards in Washington, D. C., or the National Board of Fire Underwriters, 85 John Street, New York, New York, or any other approved and nationally recognized testing laboratory.

Inspections and Tests of New Materials and Methods of Construction

Par. 1682. Before any materials or new or unusual methods of construction which may be approved by the Buildings Engineer in accordance with Paragraph 1221 of this Code are used, such materials or methods of construction shall be inspected or tested to determine whether or not such materials or methods of construction are safe and in accordance with good engineering practice.

When it is necessary that any such materials or methods of construction be tested, then not less than three tests of such materials or methods of construction shall be made and the findings of such tests shall be filed in the Bureau of Buildings before any certificate is issued.

Tests of New Materials and Methods of Construction After Approval

Par. 1686. Any and all materials or new or unusual methods of construction which are referred to in Paragraph 1221 of this Code, even though they have been approved bp the Buildings Engineer, shall be subject to all of the provisions of Chapter 16 of this Code.

SECTION 169

MISCELLANEOUS INSPECTIONS AND TESTS

Scope of Miscellaneous Inspections and Tests

Par. 1690. The scope of miscellaneous inspections and tests shall include any and all inspections, investigations, examinations or tests of any matter or thing which is specifically provided for in Chapter 16 of this Code.

Inspections of Scaffolding

Par. 1692. Any and all kinds of scaffolding, ladders and all other similar construction equipment shall be inspected and the approval of the Buildings Engineer obtained before being used.

Inspections of Construction Equipment

Par. 1693. Any and all derricks, material hoists, conveyors and similar equipment shall be inspected and the approval of the Buildings Engineer obtained before being used.

Inspections of Towers

Par. 1694. Any and all towers, together with any and all structures or equipment attached to or supported by said towers, shall be inspected upon completion of erection, and periodically thereafter as required by the provisions of Paragraph 1622 of this Code.

Inspections of Temporary Buildings

Par. 1695. Temporary buildings shall be inspected upon completion and before being used.

Inspections of Mechanical Amusement Devices

Par. 1697. All amusement devices shall be inspected upon completion of installation and before being used, and periodically thereafter as required in Paragraph 1623 of this Code.

Inspections of Miscellaneous Structures

Par. 1699. All miscellaneous structures, as defined in Section 499 of this Code, shall be inspected at least once after erection or installation and before being used, and thereafter as directed by the Buildings Engineer.

CHAPTER 17

FEES AND SERVICE CHARGES

Sec. 170—General Requirements for Service Charges.
Sec. 171—Fees for Building Permits.
Sec. 172—Fees for Special-Structure Permits.
Sec. 173—Fees for Razing and Moving Permits.
Sec. 174—Fees for Electrical Permits.
Sec. 175—Fees for Mechanical Permits.
Sec. 177—Fees for License Permits.
Sec. 178—Fees for Certificates.

SECTION 170

GENERAL REQUIREMENTS FOR SERVICE CHARGES

Basis of Fees and Service Charges

Par. 1700. All fees and charges for the various classes of permits, certificates, inspections, tests and other services rendered by the Bureau of Buildings and set forth in Chapter 17 of this Code as fixed charges, are based upon the estimated cost to the City for the services rendered.

Paymment of Fees and Service Charges

Par. 1701. Any and all fees or service charges paid in accordance with the provisions of this Code shall be paid directly to the City Collector of Baltimore.

Changing Fees and Service Charges

Par. 1702. No fee or service charge provided by the provisions of this Code shall be increased or decreased without an ordinance of the Mayor and City Council of Baltimore first having been duly passed and approved.

Time of Payment

Par. 1703. Any and all fees provided by the provisions of this Code in connection with the issuance of a permit or certificate shall be paid at the time when application for such permit or certificate is made. Any and all other fees or charges due to the Mayor and City Council of Baltimore for services rendered shall be paid when due and owing.

Minimum Fees and Service Charges

Par. 1704. Any and all fees or service charges provided for by the provisions of this Code for the various classes of permits, certificates, inspections, test or other services shall be as fixed in this Chapter, but in no case shall any fee or service charge be less than one dollar.

Duplicate and Additional Permits and Certificates

Par. 1705. Duplicate or additional copies of permits or certificates shall be issued on payment of one dollar for each duplicate or copy issued.

Fees and Service Charges Not Refundable

Par. 1706. No fee or other service charge, or portion thereof, paid for any permit, certificate, inspection, test or any other service rendered, shall be refunded.

Fees and Service Charges of Other Bureaus

Par. 1709. The payment of a fee or charge as provided by the provisions of Chapter 17 of this Code shall not be taken or construed to relieve any one from paying any and all other fees or charges that may be made by any department, bureau, commission or other agency of the Mayor and City Council of Baltimore.

SECTION 171

FEES FOR BUILDING PERMITS

Schedule of Fees for Building Permits

Par. 1711. Fees for building permits shall be based upon the following rates, which are in cents per one thousand cubic feet of gross volume of the buildings, but in no case shall the fee for any building permit be less than $10.00.

TABLE 1711T

Type of Building	Occupancy of Building					
	Public Assembly and Special (See Sec. 490)	Private Assembly and Office	Dwelling and Isntitutional	Industrial and Commercial	Storage	Multiple and Mixed
Type A Fireproof	40	30	30	25	25	40
Type B Fire-Resistant	40	30	30	25	25	40
Type C Steel Frame	40	30	30	25	20	40
Type D Slow Burning	35	30	30	25	20	35
Type E Ordinary	35	30	30	25	25	35
Type F Metal	35	30	30	25	25	35
Type G Wood Frame	30	30	30	25	30	30

The gross volume of a building shall be the volume of the building as defined in Section 201 plus the volume of any and all basements and cellars.

Fees for Revision of Building Permits

Par. 1712. After permits are issued, there shall be a fixed charge of $5.00 for each revision of the plans or specifications for a contemplated building or other structure, which revision changes the general design, construction, size or location of the contemplated building or other structure, and which revision requires new plans or specifications; and a charge of one dollar shall be made for each revision of the plans or specifications of a contemplated building or other structure which does not require new plans or specifications.

Permit Fees to Alter or Repair Buildings

Par. 1713. A charge of one dollar per one thousand dollars of estimated cost, or fraction thereof, shall be made for each permit to alter or repair a building or other structure.

SECTION 172

FEES FOR SPECIAL-STRUCTURE PERMITS

Permit Fees for Special Buildings

Par. 1720. Permit fees for special buildings shall be charged for at the rate of forty cents per one thousand cubic feet of gross volume of such special buildings.

Permit Fees for Private Bridges and Tunnels

Par. 1721. Permit fees for private bridges, viaducts, tunnels and other similar special structures shall be charged at the rate of one dollar per one thousand dollars of contract price, or estimated cost if the application is filed before the contract is awarded, of such said structures.

Permit Fees for Free-Standing and Guyed Chimneys

Par. 1722. Permit fees for free-standing and guyed chimneys shall be charged at the rate of one dollar per one hundred feet, or any fraction thereof, of height for metal chimneys, and three dollars per one hundred feet, or any fraction thereof, of height for masonry chimneys.

Permit Fees for Grain Elevators and Storage Bins

Par. 1723. Permit fees for grain elevators and storage bins shall be charged at the rate of one dollar per one thousand dollars of contract price, or estimated cost if application is filed before contract is awarded, of such said structures.

Permit Fees for Grandstands

Par. 1724. Permit fees for grandstands, stadiums, open air theatres, bleachers, reviewing stands, and similar structures for outdoor assemblies shall be charged at the rate of five dollars per one thousand, or any fraction thereof, of the seats in said structure. Where seats are not individual ones, the seating capacity of such structure shall be figured on a basis of 18 inches of seating space per person.

Permit Fees for Accessory Structures

Par. 1725. Permit fees for accessory structures shall be charged in accordance with the following:

Volume of Structure	Fee
1000 cubic feet or less	$1.00 for each structure
More than 1000 cubic feet but not exceeding 4000 cubic feet	$2.00 for each structure
More than 4000 cubic feet	$ .50 for each 1000 cubic feet of volume of structure

Permit Fees for Temporary and Portable Structures

Par. 1726. Permit fees for temporary and portable structures shall be charged, in accordance with the following table, on the basis of the length of time, as stated in the permit, such structures are to exist:

TABLE 1726T

Item		Fee For Each Temporary or Portable Structure		
		Yearly	Monthly	Weekly
Temporary Buildings	Less than 100,000 cubic feet	$5.00	$1.00	$ .50
	100,000 cubic feet and over	8.00	2.00	1.00
Portable Schools		5.00	1.00	.50
Construction Sheds		5.00	1.00	.50
Booths		2.00	1.00	.50
Car Bodies		5.00	1.00	.50
Tourist Cabins		10.00	2.00	1.00
All others		5.00	1.00	.50

No permit fee shall be charged for temporary and portable structures which are to exist for a period of less than one week.

Permit Fees for Signs

Par. 1727. Permit fees for signs shall be charged for at the rate of one cent per square foot of gross area of sign face. Where signs have two or more faces, the rate shall apply to each face of said sign. No fees shall be charged for signs less than fifty square feet which are used exclusively for advertising the property on which they are posted for sale or for rent.

Permit Fees for Amusement Devices

Par. 1728. Permit fees for amusement devices shall be charged at the rate of two dollars for each such device.

Permit Fees for Miscellaneous Structures

Par. 1729. Permit fees for miscellaneous structures shall be charged in accordance with the following:

Fences	$1.00 for the first 100 feet of length or less. $ .50 for each 100 feet of length or fraction thereof, over 100 feet up to and including 1,000 feet. $1.00 for each 1,000 feet of length or fraction thereof, over 1,000 feet.
Pigeon Coops	$1.00 each.
Swimming Pools	$5.00 each.
Radio Towers:	
Up to 50 feet in height above supports	$1.00 for all towers in one antenna system.
More than 50 feet, but not exceeding 300 feet in height	$2.00 for each tower.
More than 300 feet, but not exceeding 500 feet in height	$5.00 for each tower.
More than 500 feet in height	$10.00 for each tower.
Other Towers:	
With supported structures, such as tanks or signs	Fee is included in permit fee for the supported structure.
Without supported structure	$1.00 for 100 feet of height or fraction thereof.

58	Grading	$1.00 for each 1,000 cubic yards or fraction thereof.
59	Paving	$1.00 for each 1,000 square feet or fraction thereof.
60	Retaining Walls	$1.00 per 1,000 square feet of gross area of the vertical projection of the wall (average height multiplied by the length).
61	Motor Vehicle Parking Lots:	
	Registration and Permit Fee	$5.00 for each 5,000 square feet of area or fraction thereof.
	Annual Inspection Fee	$3.00 for each 5,000 square feet of area or fraction thereof.
61a	Trailer Camps:	
	Registration and Permit Fee	$30.00 for each 8,000 square feet of area or fraction thereof.
	Annual Inspection Fee	$5.00 for each 8,000 square feet of area or fraction thereof.
62	Other Miscellaneous Structures	$1.00 for each $1,000 estimated cost of construction or fraction thereof.

SECTION 173

FEES FOR RAZING AND MOVING PERMITS

Permit Fees to Raze Buildings

Par. 1731. Permit fees to raze buildings shall be charged at the following rates:

Volume of Building	Fee
Up to 10,000 cubic feet	$ 2.00 each building
From 10,000 to 50,000 cubic feet	4.00 each building
From 50,000 to 100,000 cubic feet	6.00 each building
From 100,000 to 500,000 cubic feet	8.00 each building
Over 500,000 cubic feet	10.00 each building

Permit Fees to Move Buildings

Par. 1732. Permit fees to move buildings shall be at the rates given in the following table:

TABLE 1732T

Volume of Building	Distance Moved			
	1000 feet or less	1001 to 2000 feet	2001 to 5000 feet	Over 5000 feet
10,000 cu. ft. or less	2.00	3.00	4.00	5.00
10,000 to 50,000	3.00	4.00	5.00	6.00
50,000 to 100,000	4.00	5.00	6.00	7.00
100,000 cu. ft. and over	5.00	6.00	7.00	8.00

Buildings dismantled and moved shall be charged for at the rate of new buildings or other structures.

SECTION 174

FEES FOR ELECTRICAL PERMITS

Permit Fees for Electric Power Equipment

Par. 1741. Permit fees for the installation of electric power equipment, such as motors, dynamos, transformers, converters and storage batteries, including the necessary wire circuits, shall be charged at the rate of five cents per horsepower or six and one-half cents per kilo-volt-ampere, except that no such fee shall be more than five dollars per unit.

Permit Fees for Electrical Appliances

Par. 1742. Permit fees for electrical appliances, such as motion-picture machines, rectifiers, oil burners, refrigerators and x-ray machines, including the necessary wire circuits, shall be at the rate of one dollar for each such appliance. For switchboards, the rate shall be twenty-five cents per square foot of board, or fraction thereof.

Permit Fees for Electric Lighting Circuits

Par. 1743. Permit fees for electric wiring for lighting and general use shall be based on the number and size of circuits supplying outlets, and shall be charged at the following rates, which are in cents per circuit:

TABLE 1743T

Capacity of Circuit	For each circuit of the first 10 circuits	For each circuit of the next 90 circuits	For each circuit of the next 900 circuits	For each additional circuit over 1000
15 amp.	$ 0.15	$ 0.10	$ 0.05	$ 0.01
20 amp.	0.20	0.15	0.10	0.02
25 amp.	0.25	0.20	0.15	0.05
30 amp.	0.30	0.25	0.20	0.08
Over 30 amp.	0.40	0.30	0.25	0.10

Permit Fees for Lighting Fixtures

Par. 1744. Permit fees for lighting fixtures shall be charged at the rate of five cents per fixture, except that the charge for any one permit shall not exceed ten dollars.

Permit Fees for Electric Signs and Borders

Par. 1745. Permit fees for electric signs and border lighting shall be charged at the rate of one dollar per kilo-volt-ampere, computed from the nominal voltage and the permitted capacity of the conductors at the sign.

Permit Fees for Temporary Wiring

Par. 1746. Permit fees for temporary electric wiring for circuses, carnivals, exhibitions, expositions, or other similar purposes shall be charged at the rate of $1.00 for each 10 kilowatts, or any fraction thereof, of feeder capacity supplying such wiring.

No permit fee shall be charged when the net proceeds derived from any circus, carnival, exhibition or exposition are to be used for a charitable or religious purpose.

Permit Fees for Electrical Alterations

Par. 1748. The permit fee for the alteration or reconstruction of electric wiring, equipment or appliances shall be one dollar for each permit.

Miscellaneous Electrical Permit Fees

Par. 1749. The fee for an electrical permit not otherwise fixed in this Section shall be one dollar for each permit.

SECTION 175

FEES FOR MECHANICAL PERMITS

Permit Fees for Elevators

Par. 1751. Permit fees for elevators shall be charged in accordance with the following:

Equipment	Permit Fee
Passenger elevators	$15.00 each
Power freight elevators	10.00 each
Hand or gravity elevators	1.00 each
Escalators	15.00 each
Cranes, hoists and conveyors	3.00 each
Power dumbwaiters	5.00 each
Hand dumbwaiters	1.00 each
Personal service elevators	10.00 each
Stage, orchestra and organ-console elevators	10.00 each
Stairway lifts and invalid elevators	1.00 each
Man lifts and automobile hoists	3.00 each
Builders' hoists and elevators temporarily used as builders' hoists	2.00 each

Reconstruction—Same as required above for new elevators.
Alteration—$2.00 for each permit.
Repairs—No charge.

Permit Fees for Power Machinery

Par. 1752. The permit fee for a prime mover or a power-driven machine shall be charged at the rate of one cent per horsepower, provided, however, that the maximum fee shall not exceed $10.00 for any one permit.

Permit Fees for Boilers and Unfired Pressure Vessels

Par. 1753. Permit fees for boilers and unfired pressure vessels, including supports, piping and all other work incidental to their installation, shall be charged in accordance with the following:

Equipment	Permit Fee
Power boilers:	
100 horsepower and over	$10.00 each
Under 100 horsepower	6.00 each
Low pressure heating boilers (over 1400 square feet radiation)	5.00 each
Low pressure heating boilers (1400 square feet or less radiation)	2.00 each
Miniature boilers (high pressure)	2.00 each
Unfired pressure vessels:	
From 8 to 100 cubic feet capacity	1.00 each
Over 100 cubic feet capacity	2.00 each
Alterations	1.00
Repairs	no charge

Permit Fees for Furnaces and Fuel Burners

Par. 1754. Permit fees for furnaces and fuel-burning equipment shall be charged in accordance with the following:

Furnaces equipped with grates, except in low-pressure boilers	$ .10 per square foot of grate area
Stokers	$1.00 each
Oil Burners (includes piping and tank):	
For domestic heating plants	$1.00 per furnace
For other heating plants	$3.00 per furnace
Gas Burners, based upon size of supply pipe to each appliance or furnace, as follows:	
1 inch or less	$1.00
1¼ and 1½ inches	$1.50
2 and 2½ inches	$2.00
3 and 3½ inches	$3.00
4 inches and over	$5.00

Permit Fees for Heating and Ventilating Systems

Par. 1755. Permit fees for warm-air heating or ventilating systems, including fans, filters, and other accessories, except evaporators, shall be charged for at the rate of fifty cents for each 1,000 cubic feet per minute of air circulating capacity or fraction thereof, but never less than one dollar for any one installation. For systems comprising radiating heating units, piping and accessories, the charge shall be at the rate of one dollar for each 1,000 square feet of installed equivalent steam radiation or fraction thereof.

Permit Fees for Refrigerating Systems

Par. 1756. Permit fees for refrigerating systems and refrigerators in air-conditioning systems shall be charged in accordance with the following:

Class A Systems	$5.00 each
Class B Systems	$3.00 each
Class C Systems	$2.00 each
Class D Systems	$1.00 each
Class E Systems	No charge

Permit Fees for Tanks

Par. 1757. Fees for permits to install, erect or construct tanks shall be charged in accordance with the following:

Capacity of Tank	Fee
Up to 200 gallons	No charge
From 200 to 2,000 gallons	$ 1.00 each tank
From 2,000 to 5,000 gallons	2.00 each tank
From 5,000 to 10,000 gallons	5.00 each tank
From 10,000 to 50,000 gallons	7.00 each tank
From 50,000 to 100,000 gallons	10.00 each tank
From 100,000 to 400,000 gallons	15.00 each tank
From 400,000 to 750,000 gallons	25.00 each tank
From 750,000 to 1,000,000 gallons	37.00 each tank
Over 1,000,000 gallons	50.00 each tank

Permit Fees for Fire Extinguishing Appliances

Par. 1758. Fees for permits to install fire-extinguishing appliances shall be charged in accordance with the following:

Sprinkler Systems	$1.00 per 1,000 heads, or fraction thereof
Standpipe Risers	$1.00 each
CO_2 Systems	$1.00 per 5,000 cubic feet, fraction thereof, of the space protected
Foam Systems	$1.00 each
Hand Extinguishers	No charge
Alterations	No charge

Miscellaneous Mechanical Permit Fees

Par. 1759. The fee to be charged for a mechanical permit not otherwise fixed in this Section shall be one dollar for each permit.

SECTION 177

FEES FOR LICENSE PERMITS

Permit Fees for Annual Licenses

Par. 1772. Fees for annual license permits to operate Public Assembly buildings shall be charged in accordance with the following:

TABLE 1772T

Class of Building	Area of Building in Square Feet				
	1000 or less	1000 to 6000	6000 to 12,000	12,000 to 24,000	24,000 and up
Opera houses and theatres with stages	8.00	10.00	15.00	18.00	20.00
Theatres without stages	5.00	8.00	10.00	12.00	15.00
Exhibition Halls	3.00	5.00	10.00	12.00	15.00
Dance Halls	3.00	5.00	10.00	12.00	15.00
Sports Arenas	3.00	5.00	10.00	12.00	12.00
Assembly Halls	2.00	3.00	5.00	8.00	10.00

Where an assembly building is used for two or more classes of public assembly, the annual license permit fee shall be the same as for the class requiring the highest fee.

No permit fee shall be charged when the net proceeds derived from any of the aforementioned classes of buildings are to be used for a charitable or religious purpose.

Permit Fees for Special Licenses

Par. 1773. Fees for special license permits to present dramatics, circuses, displays, dances, card parties, lectures, or other similar assemblies, on premises for which no annual license has been issued as provided by Paragraph 1772 of this Code, shall be charged in accordance with the following:

TABLE 1773T

Purpose	One Month	One Week	One Day
Dramatics	5.00	3.00	1.00
Cinema Shows	5.00	3.00	1.00
Dances	5.00	3.00	1.00
Card Parties	5.00	3.00	1.00
Lectures	2.00	1.00	1.00
Exhibitions	2.00	1.00	1.00
Circuses	5.00	3.00	1.00
Displays	4.00	2.00	1.00

No permit fee shall be charged when the net proceeds derived from any of the aforementioned assemblies are to be used for a charitable or religious purpose.

SECTION 178

FEES FOR CERTIFICATES

Fees for Building Certificates

Par. 1781. Fees for building certificates shall be charged in accordance with the following, except that no charge shall be made where the fee for annual license permits have been paid:

Public and private Assembly Buildings	$1.00 each
Dwellings:	
Hotels and apartment houses, over 75,000 cubic feet	5.00 each
Dwellings with 3 apartments or less	1.00 each
Institutions	1.00 each
Office Buildings, over 25,000 cubic feet	5.00 each
Commercial Buildings, over 25,000 cubic feet	5.00 each
Storage Buildings, over 25,000 cubic feet	3.00 each
Industrial Buildings, over 25,000 cubic feet	5.00 each
Office, Commercial, Storage and Industrial Buildings, not exceeding 25,000 cubic feet, and hotels and apartments not exceeding 75,000 cubic feet	2.00 each
Special Structures	1.00 each
Combination store and dwelling	2.00 each
Additional certificates	1.00 each

Fees for General Certificates

Par. 1786. A charge of five dollars shall be made for each general certificate, as defined in Section 151 of this Code.

Fees for Electrical Certificates

Par. 1787. No charge shall be made for electrical certificates.

Fees for Mechanical Certificates

Par. 1788. Fees for mechanical certificates shall be in accordance with the following:

TABLE 1788T

Equipment	Registration Fee	Fee for Annual Inspection	
		By City Inspector	By Insurance Company Inspector
High pressure boilers:			
100 horsepower and over	5.00	*5.00	
Under 100 horsepower	3.00	*2.00	
Passenger elevators	8.00	9.00	3.00
Power freight elevators	7.00	6.00	2.00
Hand or gravity elevators	5.00	6.00	2.00
Escalators	8.00	9.00	3.00
Cranes, hoists and conveyors	3.00	6.00	2.00
Dumbwaiters	3.00	6.00	2.00
Personal service elevators	5.00	9.00	3.00
Stage, orchestra and organ console elevators	8.00	9.00	3.00
Stairway lifts and invalid elevators	3.00	5.00	3.00
Man lifts	5.00	6.00	2.00

* Not required if certificate is issued by Maryland State Boiler Inspector.

The registration fees for elevators and high pressure boilers include the fee for one inspection certificate.

Fees for Miscellaneous Certificates

Par. 1789. No charge shall be made for miscellaneous certificates.

CHAPTER 18

ROUTINE AND PROCEDURE

Sec. 180—General Requirements for Routine and Procedure.
Sec. 181—Rules and Regulations.
Sec. 182—Complaints.
Sec. 183—Notices.
Sec. 184—Procedure for Hearings.
Sec. 185—Condemnation Proceedings.
Sec. 187—Procedure for Emergency Work.
Sec. 188—Reports and Records.

SECTION 180

GENERAL REQUIREMENTS FOR ROUTINE AND PROCEDURE

Scope of Routine and Procedure

Par. 1800. Routine and procedure shall include the promulgation, adoption and enforcement of rules and regulations; the receiving and manner of handling complaints; the form and regulations for serving of notices; the requirements for holding public hearings; condemnation proceedings, procedure for vacating premises; the action and procedure to be taken in emergency work; the making of reports and keeping of records; and other similar matters pertaining to the administration of the Bureau of Buildings.

SECTION 181

RULES AND REGULATIONS

Classification of Rules and Regulations

Par. 1811. Rules and regulations of the Buildings Engineer shall be divided into:

a. Rules for conduct of office affecting employees only.
b. Rules for conduct of office affecting the general public.
c. Regulations governing new materials and methods of construction.
d. Interpretation of the Code by Buildings Engineer.
e. Rules for Complaints and Notices.
f. Rules for Decisions by Buildings Engineer.
g. Miscellaneous rules and regulations.

Rules for Employees

Par. 1812. General rules governing the conduct, credentials and duties of employees shall be in writing and promulgated in form of "General Orders".

Office Rules and Regulations Affecting the Public

Par. 1813. General rules and regulations governing the office hours of inspectors, filing of applications for permits and certificates, filing of complaints, notices, hearings, and all matters relating thereto shall be promulgated in the form of "Bulletins" posted on a public Bulletin Board and copies of such "Bulletins" shall be available to all who may desire them.

Rules for Approval of New Materials and Methods of Construction

Par. 1814. Copies of all general certificates issued by the Buildings Engineer in accordance with the terms and provisions of Paragraph 1510 of this Code shall be kept in a separate file and such copies of general certificates shall be accessible to the public for examination.

Rules for Interpretations of Code

Par. 1816. Whenever interpretations of this Code are made by the Buildings Engineer, such interpretations shall be promulgated by the Buildings Engineer in writing, entitled "Interpretations of the Baltimore City Building Code". Copies of all such said interpretations shall be posted on the public Bulletin Board mentioned in Paragraph 1813 of this Code, and copies of such interpretations shall be issued to all persons who may request the same.

Rules for Decisions by Buildings Engineer

Par. 1817. Copies of decisions made by the Buildings Engineer after hearings held in accordance with Section 184 of this Code shall be recorded and filed as required in said Section 184.

Miscellaneous Rules and Regulations

Par. 1819. Miscellaneous rules and regulations for the administration of the Bureau of Buildings not already provided for in this Code shall be made by the Buildings Engineer in such form and manner as he may direct.

SECTION 182

COMPLAINTS

Scope of Complaints

Par. 1820. Complaints shall include any and all written or verbal complaints or information pertaining to any and all matters or things provided for by the provisions of this Code.

Classification of Complaints

Par. 1821. Complaints shall be classified as follows:

1. Protests against permits applied for or issued.
2. General complaints of actual or alleged violations of the provisions of this Code.
3. Miscellaneous complaints.

Filing of Complaints

Par. 1822. A record shall be made of any and all complaints received by the Bureau of Buildings, and such records shall be properly filed in the Bureau of Buildings.

Investigation of Complaints

Par. 1823. Every written complaint which is signed by the complainant and received in the Bureau of Buildings shall be investigated by said Bureau, and the findings of such investigation shall be made in the form of a report.

Reports on Complaints

Par. 1824. All reports made in connection with complaints received in the Bureau of Buildings shall be filed as required in Paragraph 1886 of this Code.

Action on Complaints

Par. 1825. The Buildings Engineer shall make a decision, in writing, if he deems it necessary, on all complaints filed in accordance with the provisions of Section 182 of this Code within 30 days after the date on which a complaint is received. In the event that a hearing is held by the Buildings Engineer in connection with any complaint filed in the Bureau of Buildings, the Buildings Engineer shall render a written decision in connection with any such complaint within 30 days after such hearing is finally terminated.

Hearings on Complaints

Par. 1826. Whenever the person complaining or the person complained against requests a hearing in connection with any complaint filed in the Bureau of Buildings, the Buildings Engineer shall hold such a hearing in accordance with the provisions of Section 184 of this Code. In all cases where a complaint is filed in the Bureau of Buildings, the Buildings Engineer may hold a hearing in accordance with the provisions of Section 184 of this Code.

Recording of Complaints

Par. 1829. All complaints, together with all correspondence, inspection reports, minutes of hearings, and decisions of the Buildings Engineer relating thereto, shall be recorded in accordance with the provisions of Section 188 of this Code.

SECTION 183

NOTICES

General Requirements for Notices

Par. 1830. Any and all notices issued by the Buildings Engineer pursuant to or in connection with the provisions of this Code shall be issued in accordance with the provisions of Section 183 of this Code.

Classes of Notices

Par. 1831. Notices issued by the Buildings Engineer shall be of three kinds: (1) Condemnation Notices, (2) Violation Notices and (3) Miscellaneous Notices.

Forms of Notices

Par. 1832. Condemnation notices shall be issued in not less than quadruplicate on special forms eight and one-half inches by eleven inches in size and one copy of such notices shall be sent to the Police Commissioner for the City of Baltimore and the Board of Fire Commissioners of Baltimore City.

Violation notices shall be issued on special forms eight and one-half inches by eleven inches in size, and one copy of such notices shall be sent to all Bureaus, Boards, Departments, or other agencies of the Mayor and City Council of

Baltimore, which may be concerned with the subject matter of any such notice.

Miscellaneous notices shall be on such forms as the Buildings Engineer may direct.

Information on Notices

Par. 1833. Every condemnation notice shall set forth the location of the premises on which the condemned building, structure or other object is situated, the reason why the building, structure or other object is condemned, a reference to the provision or provisions of this Code which is applicable in the premises, the requirements of the Buildings Engineer which must be complied with in order to remove the unsafe condition, the period of time in which the requirements of the Buildings Engineer must be complied with, and a warning concerning the entering of such condemned building, structure or other object.

Every violation notice shall set forth the location of the premises on which the violation has been or is being committed, the character of the violation, a reference to the provision or provisions of this Code which is applicable in the premises, the requirements of the Buildings Engineer which must be complied with in order to rectify the violation, and the period of time in which the requirements of the Buildings Engineer must be complied with.

Every miscellaneous notice shall set forth all important facts relating to the matter covered by the notice, the requirements of the Buildings Engineer which must be complied with in order to correct the condition set forth in such notice, and the period of time in which the requirements of the Buildings Engineer must be complied with.

Serving of Notices

Par. 1834. Any and all notices or orders issued by the Buildings Engineer pursuant to or in connection with the provisions of this Code shall be served on the owner or any one of several owners of the property which is the subject of any such notice or order, or on any duly authorized agent of any such owner or owners.

All condemnation and violation notices shall be served by members of the Police Department of Baltimore City, or by registered mail, or by an official or employee of the Mayor and City Council of Baltimore or the State of Maryland.

All miscellaneous notices shall be served by members of the Police Department of Baltimore City, by mail, by an official or employee of the Mayor and City Council of Baltimore or the State of Maryland, or by any other means which may be deemed proper by the Buildings Engineer.

Nothing contained in this Code shall be taken or construed to excuse or relieve any person, firm or corporation from fully complying with any and all of the provisions of this Code for any and all times, regardless of whether or not any notice or order has been issued by the Buildings Engineer in any particular case.

When Notices Cannot Be Served

Par. 1835. In the event that the owner of any land, building, structure or other object in or upon which there exists a condition which is unsafe or dangerous to the public health or safety, or in or upon which the terms and provisions of this Code are being violated, does not reside in the City of Baltimore, State of Maryland, or the whereabouts of any such owner, regardless of whether or not such owner is actually residing in the said City of Baltimore, can not be ascertained by the Buildings Engineer by examining the tax records of the said City of Baltimore and the latest Baltimore telephone directory and the latest Baltimore City Directory, and making inquiry of the occupants of any such land, building, structure or other object, then it shall not be necessary to serve notices or orders issued by the Buildings Engineer pursuant to or in connection with the provisions of this Code on the owner or owners of any such land, building, structure or other object, as provided in Paragraph 1834 of this Code, but in lieu thereof, any and all notices or orders issued by the Buildings Engineer pursuant to or in connection with the provisions of this Code, shall be conspicuously posted by a duly authorized employee of the Bureau of Buildings upon that part of any land, building, structure or other object to which such notice or order relates, which is closest to a street or public highway, so that such said notice or order shall be visible to the general public.

After any aforesaid notice or order has been posted as aforesaid, the Buildings Engineer shall take no action in connection with any premises so posted until and after the expiration of a period of 30 days, except that in cases of emergency, the Buildings Engineer shall proceed in accordance with the provisions of Section 187 of this Code.

In all cases where any notice or order issued by the Buildings Engineer is posted on any land, building, structure or other object as herein above provided, such posting shall be deemed to be an adequate and sufficient service of any such notice or order upon the owner of any such premises.

Failure to Comply With Notices

Par. 1836. In the event that any person fails to comply with the requirements of the Buildings Engineer as set forth in a condemnation notice, the Buildings Engineer shall proceed in accordance with the provisions of Section 185 of this Code.

In the event that any person fails to comply with the requirements of the Buildings Engineer as set forth in a violation notice, the Buildings Engineer shall take any and all action that may be necessary and shall institute or cause to be instituted any and all appropriate actions or proceedings, including criminal or equitable proceedings, which may be necessary and proper, to prevent the commencement or the continuation of, or to eliminate or rectify, the condition or conditions which are complained of or which are the subject matter of a violation notice.

In the event that any person fails to comply with the requirements of the Buildings Engineer as set forth in a miscellaneous notice, the Buildings Engineer shall take such action as he may deem necessary and proper, including the institution of any and all legal, equitable or criminal proceedings which may be necessary and proper to compel a compliance with the requirements of the Buildings Engineer as set forth in a miscellaneous notice.

Extension of Time Limit on Notices

Par. 1837. The period or periods of time within which the requirements of the Buildings Engineer, as set forth in a condemnation notice, must be complied with, shall not be extended in any case.

The Buildings Engineer may extend the period or periods of time within which the requirements of the Buildings Engineer, as set forth in either a violation notice or in a miscellaneous notice, must be complied with, if, in the judgment of the Buildings Engineer, a longer period or periods of time may be necessary to comply with the said requirements of the Buildings Engineer.

Removal or Defacement of Posted Notices

Par. 1838. No person, firm or corporation shall remove, deface, damage, alter, change or modify any notice, poster or sign placed on any land, building, structure or other object, or any part thereof, as required by the provisions of this Code until and after the Buildings Engineer has authorized the removal of any such notice, poster or sign. Each and every violation of the provisions of this paragraph shall be and constitute a safety violation.

Notices for Buildings Owned by the Mayor and City Council of Baltimore

Par. 1839. In the event that any land, building or other structure owned by the Mayor and City Council of Baltimore, to which the provisions of this Code apply, does not comply with any and all of the terms and provisions of this Code, the Buildings Engineer shall notify the bureau, department, commission or other agency of the Mayor and City Council of Baltimore having jurisdiction over such land, building or other structure wherein any such land, building or other structure fails to comply with the terms and provisions of this Code.

SECTION 184

PROCEDURE FOR HEARINGS

General Requirements for Hearings

Par. 1840. Any and all hearings which are to be held by the Buildings Engineer in accordance with the terms and provisions of this Code shall be held in accordance with the provisions of Section 184 of this Code.

Hearings Open to the Public

Par. 1841. All hearings held by the Buildings Engineer shall be open to the public.

Notification of Complainants

Par. 1842. Any and all persons whom the Buildings Engineer knows is interested in any hearing to be held by the Buildings Engineer shall, before the time such hearing is held, be notified where and when such hearing will be held, as well as the purpose of such hearing, by the Buildings Engineer.

Place for Hearings

Par. 1843. Any and all hearings which may be held by the Buildings Engineer shall be held in the office of the Buildings Engineer or at such other place as the Buildings Engineer may designate.

Time For Hearings

Par. 1844. Any and all hearings to be held by the Buildings Engineer shall be held at such time as may be designated by the Buildings Engineer.

Presiding Officer At Hearings

Par. 1845. The Buildings Engineer shall be the presiding officer at any and all hearings which may be held by the Buildings Engineer.

If, for any reason whatsoever, the Buildings Engineer cannot preside over any such hearing, the Deputy Buildings Engineer shall be the presiding officer at any such hearing.

Rules for Conducting Hearings

Par. 1846. The Buildings Engineer may make any and all rules and regulations which he may deem necessary for the proper conduct of any and all hearings to be held by the Buildings Engineer.

Decision on Hearings

Par. 1847. After any particular hearing has been finally completed, the Buildings Engineer shall render his decision in writing within a period of 30 days accounting from the last day of any such hearing. The Buildings Engineer shall include in his said written decision the reasons for his decision.

Records of Hearings

Par. 1848. A complete record of all papers filed with the Buildings Engineer in connection with any hearing held by him, together with a copy of the written decision of the Buildings Engineer, shall be kept and filed in the Bureau of Buildings, as required by the provisions of Section 188 of this Code.

Appeals from Hearings

Par. 1849. Any person, firm or corporation who disagrees with or is aggrieved by any order or decision of the Buildings Engineer may institute in any court of competent jurisdiction such legal proceedings as he or it may deem necessary concerning any such order or decision, or any person, firm or corporation shall have the right to refer any such order or decision to a Board of Arbitration for review and decision, as provided in Section 194 of this Code.

SECTION 185

CONDEMNATION PROCEEDINGS

Condemnation by Buildings Engineer

Par. 1850. In the event that the owner of any land, building, structure or other object, or any equipment contained therein, fails to comply with the requirements of the Buildings Engineer as set forth in a condemnation notice, within the time stated in said notice, the Buildings Engineer shall condemn such land, building, structure, equipment or other object as being unsafe or dangerous to the public health or safety.

Posting of Condemned Structures

Par. 1851. In the event that any land, building, structure or other object is condemned by the Buildings Engineer as being unsafe or dangerous to the public health or safety, the said Buildings Engineer shall cause a notice to be conspicuously displayed upon that part of the condemned land, building, structure or other object which is closest to a street or public highway, so that such said notice shall be visible to the general public at all times. All such notices shall advise the public that the particular land, building, structure or other object has been condemned as being unsafe or dangerous for occupancy and that anyone entering therein does so at his own risk.

All such notices shall be not less than eleven inches by seventeen inches in size, and shall be signed by the Buildings Engineer.

However, in case of the existence of an emergency where life or property may be in immedate danger, the Buildings Engineer shall proceed in accordance with the provisions of Section 187 of this Code.

Vacating Condemned Buildings

Par. 1852. Whenever any land, building, structure or other object has been condemned by the Buildings Engineer, and the notice has been posted as required by the provisions of Paragraph 1851 of this Code, such notice shall be deemed as sufficient warning to all of the occupants of such condemned land, building, structure or other object to leave the same immediately. In the event that any occupant of any such condemned land, building, structure or other object fails to vacate such condemned premises immediately after the posting of the aforesaid notice or when ordered to do so by the Buildings Engineer or his duly authorized agent, any member of the Police Department of Baltimore City shall compel any such occupant to immediately evacuate such condemned land, building, structure or other object.

Protection of Dangerous Conditions

Par. 1853. After any condemned land, building, structure or other object has been vacated, the Buildings Engineer shall have any and all openings in any such land, building, structure or other object boarded up or otherwise effectively barricaded to prevent ingress or egress from any such building, structure or other object, and shall take any and all other action that may be necessary to protect the public safety.

Notice to Adjoining Property Owners

Par. 1854. After the expiration of a period of ten days accounting from the time when any land, building, structure or other object which has been condemned has been posted in accordance with the provisions of Paragraph 1851 of this Code, the Buildings Engineer shall notify the owners of the properties immediately adjoining such condemned land, building, structure or other object of the action that the Buildings Engineer intends to take to remedy the existing dangerous or unsafe condition of the condemned land, building, structure or other object, and such notice shall contain an approximate time when such action will commence.

Removal of Unsafe Conditions

Par. 1855. The Buildings Engineer is hereby authorized and empowered to raze, demolish, move, remove, alter, repair, rebuild, reconstruct, or take any other action which may be necessary to eliminate or make safe and secure any dangerous or unsafe condition or conditions which caused any particular land, building, structure, equipment, or other object to be condemned. Before the Buildings Engineer acts in accordance with the aforegoing provisions of this Paragraph, he shall comply with all of the provisions of this Code pertaining to the condemnation of any land, building, structure, equipment or other object.

Liability for and Collection of Costs for Removal of Unsafe Conditions

Par. 1856. Provision is made concerning the liability for and the collection of expenditures made in the removal of unsafe or dangerous conditions in Paragraph 1930 and Paragraph 1931 of this Code.

Condemnation of Electrical Work

Par. 1857. In the event that any electrical wiring or equipment which has been the subject of a condemnation notice is not made safe as required in such condemnation notice within the time allowed in such notice, such electrical wiring or equipment shall be put out of service by cutting off all electric current thereto, and sealing all switches which may be operated in connection with such equipment.

In case of the existence of an emergency where life or property is in immediate danger, the Buildings Engineer is hereby authorized and empowered to, and shall promptly order all electric current serving such wiring or equipment to be cut off, and all switches sealed, which may control any such wiring or equipment, and the orders of the Buildings Engineer shall be immediately complied with, regardless of any other provisions of this Code which may be applicable in the premises.

Whenever the electric current to any wiring or equipment has been cut off or any switches which may be operated in connection with such wiring or equipment have been sealed, such electric current shall not be cut in nor shall the seals placed on said switches be broken, except by a duly authorized agent of the Buildings Engineer, after all of the requirements of the Buildings Engineer have been complied with, and a certificate of approval has been issued by the Buildings Engineer.

Condemnation of Mechanical Work

Par. 1858. In the event that any mechanical equipment which has been the subject of a condemnation notice is not made safe as required in such condemnation notice within the time allowed in such notice, such mechanical equipment shall be put out of service and sealed.

In case of the existence of an emergency where life or property is in immediate danger, the Buildings Engineer is hereby authorized and empowered to, and shall promptly order all mechanical equipment to be put out of service and sealed, and the orders of the Buildings Engineer shall be immediately complied with, regardless of any other provisions of this Code which may be applicable in the premises.

Whenever any mechanical equipment has been put out of service and sealed, such mechanical equipment shall not be again put in service, nor shall the seals which have been placed on said mechanical equipment be broken, except by a duly authorized agent of the Buildings Engineer, after all of the requirements of the Buildings Engineer have been complied with, and a certificate of approval, when required by the provisions of this Code, has been issued by the Buildings Engineer.

SECTION 187

PROCEDURE FOR EMERGENCY WORK

Power of the Buildings Engineer in Emergencies

Par. 1870. In case of the existence of an emergency where life or property is in immediate danger, and there is not sufficient time to comply with the provisions of Section 185 of this Code, the Buildings Engineer is hereby authorized and empowered to, and shall, promptly and immediately take any and all action that may be necessary to protect such life or property, without complying with the provisions of Section 185 of this Code.

Photographs of Dangerous Conditions

Par. 1871. In all cases of emergency when it is practical and there is sufficient time to do so, the Buildings Engineer shall have photographed the dangerous or unsafe condition which creates such emergency, before any demolition or other work or operation is commenced to eliminate such dangerous or unsafe condition.

Labor and Material for Emergency Work

Par. 1872. In all cases of emergency where life or property is in immediate danger and it is necessary to perform any work or operation to protect such life or property, the Buildings Engineer is hereby authorized and empowered to temporarily employ such persons and purchase such material, either directly or by contract, as may be necessary to perform such work or operation.

Liability for and Collection of Costs of Emergency Work

Par. 1876. Provision is made concerning the liability for and the collection of expenditures made in the course of performing emergency work in Paragraph 1930 and Paragraph 1931 of this Code.

SECTION 188

REPORTS AND RECORDS

General Requirements for Reports and Records

Par. 1880. Any and all correspondence, complaints, notices, reports of inspection and investigations, statistical reports, and any and all other notices or reports of every kind not specifically mentioned herein, pertaining to any and all matters provided for by the terms and provisions of this Code or which may arise in connection with the operation of the Bureau of Buildings, shall be in writing, and upon the receipt of the same in the Bureau of Buildings, shall be properly recorded and filed in said Bureau.

Annual Report for Department of Public Works

Par. 1881. The Buildings Engineer shall make an annual report to the Chief Engineer of the Mayor and City Council of Baltimore concerning the operations of the Bureau of Buildings, and such other similar reports as may be called for from time to time by the Chief Engineer of the Mayor and the City Council, or the Mayor or City Council of Baltimore.

Periodic and Routine Inspection Reports

Par. 1882. Reports shall be made of all periodic and routine inspections, as required by the provisions of Sections 162 and 163 of this Code, in the form and as required by the Buildings Engineer.

Miscellaneous Inspection Reports

Par. 1883. Reports shall be made on all miscellaneous inspections, tests required by the provisions of Section 169 of this Code, and all other matters on which reports are required or requested by the Buildings Engineer.

Records of Applications, Permits and Certificates

Par. 1884. All applications and copies of permits and certificates for new buildings, miscellaneous structures, alterations, repairs, razing or moving of buildings, shall be filed in the Bureau of Buildings in a permanent file according to the established block and lot number, now known and hereafter referred to as the general file. Copies of permits and certificates shall also be kept in the Bureau of Buildings in another file in numerical order.

All other applications, permits and certificates shall be recorded and filed in the Bureau of Buildings as directed by the Buildings Engineer.

Records of Approved Drawings and Specifications

Par. 1885. All drawings and specifications approved by the Buildings Engineer shall be filed in the Bureau of Buildings in chronological order and they shall be preserved for a period of at least twenty years.

Records of Complaints and Notices

Par. 1886. All complaints and copies of all notices shall be permanently filed among the records of the Bureau of Buildings and shall be filed as directed by the Buildings Engineer.

Records of Decisions by Boards of Appeals

Par. 1887. A record of all decisions rendered by Boards of Appeals provided in Section 194 of this Code shall be permanently kept in the files of the Bureau of Buildings.

Records of Correspondence

Par. 1888. All correspondence relating to any particular premises shall be preserved in the general file.

Statistical Records

Par. 1889. Records of all building operations in Baltimore, Maryland, and all activities of the Bureau of Buildings shall be kept and tabulated in such form as the Buildings Engineer may direct.

CHAPTER 19

ENFORCEMENT

Sec. 190—General Enforcement Regulations.
Sec. 191—Violations of Code.
Sec. 192—Penalties for Violations of Code.
Sec. 193—Collection of Fees and Charges.
Sec. 194—Boards of Appeals.
Sec. 197—Cooperation of Other Departments.

SECTION 190

GENERAL ENFORCEMENT REGULATIONS

Authority to Enforce Code

Par. 1900. Reference is made to Paragraph 1201 of this Code, which authorizes and empowers the Buildings Engineer to enforce the provisions of this Code.

Stopping of Work

Par. 1902. Whenever any work or operation is being done or performed without a permit required under the provisions of this Code, first having been issued by the Buildings Engineer, the Buildings Engineer shall order such work or operation to be stopped immediately and no further work or operation shall be done or performed until and after the entire matter has been finally disposed of by the Buildings Engineer.

In all cases where a permit has been issued for the doing of any work or the performance of any operation and such work or operation is being done or performed in violation of any of the provisions of this Code or any of the terms and conditions which form a part of any issued permit or of any of the approved plans and specifications for such work or operation, the Buildings Engineer is hereby authorized and empowered to stop such work or operation by notifying in writing the person to whom the permit has been issued, or the person who is doing or performing the work or operation, to immediately cease said work or operation, and upon the receipt of such notice, no further work or operation shall be done or performed until and after the person to whom the permit has been issued, or the person who is doing or performing the work or operation, has been again notified in writing by the Buildings Engineer that he may proceed. However, the provisions of Paragraph 1902 do not apply where a departure or deviation from the approved plans or specifications does not or cannot be a violation of the provisions of this Code.

Revocation of Permits

Par. 1903. The Buildings Engineer is hereby authorized and empowered to revoke any permit which has been issued in error, or any permit which has been issued based upon an application, drawings or specifications which contain a false or misleading statement, or a misrepresentation of a material fact or facts.

Refusal to Grant a Permit

Par. 1904. The Buildings Engineer shall refuse to issue a permit authorizing any work to be done or operation performed, if the doing of such work or the performance of such operation would be a violation of any law, ordinance, rule or regulation of the State of Maryland or of the Mayor and City Council of Baltimore or of any rule or regulation of any of the Bureaus, Departments, Commissions or other Agencies of either the State of Maryland or the Mayor and City Council of Baltimore, even though the contemplated work or operation would conform to the requirements of this Code.

SECTION 191

VIOLATIONS OF CODE

Violations

Par. 1911. Violations of the provisions of this Code are hereby classified and designated as follows:

a. Safety Violations.

b. Health Violations.

c. Fire Violations.

d. Administrative Violations.

e. Technical Violations.

f. Miscellaneous Violations.

Safety Violations

Par. 1912. Any and all acts or actions which are contrary to any provision or requirement of, and any and all failures to comply with any provision or requirement of, Chapter 23, Section 240, Section 241, Section 242, Section 243, Section 244, Section 245, Section 246, Section 249, Section 250, Section 252, Section 256, Section 260, Section 261, Section 262, Section 292, Section 415, Section 417, Section 425, Section 427, Section 435, Section 437, Section 445, Section 447, Section 455, Section 457, Section 465, Section 467, Section 475, Section 477, Section 485, Section 487, Section 490, Section 491, Section 492, Section 496, Section 497, Section 498, Chapter 60, Chapter 70, Chapter 71, Chapter 72, Chapter 73, Chapter 74, Chapter 75, Chapter 76, Chapter 77, Chapter 80, Chapter 81, Chapter 82, Chapter 83, Chapter 84, Chapter 85, Chapter 86, Chapter 87, Chapter 88, Chapter 89, Chapter 91, Chapter 92, Chapter 93, or Chapter 97, of this Code, and any and all acts or actions which are contrary to, and any and all failures to comply with, any provision of any order, requirement, decision or notice of the Buildings Engineer or any other person, board, department, bureau, commission or other agency having jurisdiction, relative to any provision or requirement of the aforesaid Chapters and Sections of this Code, shall be and constitute a Safety Violation, except and unless it is specifically provided in the aforesaid Chapters and Sections of this Code that a different class of violation shall be applicable.

Health Violations

Par. 1913. Any and all acts or actions which are contrary to any provision or requirement of, and any and all failures to comply with any provision or requirement of, Section 247, Section 294, Section 416, Section 426, Section 436, Section 446, Section 456, Section 466, Section 476, Section 486, Chapter 95, or Chapter 96 of this Code, and any and all acts or actions which are contrary to, and any and all failures to comply with, any provision of any order, requirement, decision or notice of the Buildings Engineer or any other person, board, department, bureau, commission or other agency having jurisdiction, relative to any provision or requirement of the aforesaid Chapters and Sections of this Code, shall be and constitute a Health Violation, except and unless it is specifically provided in the aforesaid Chapters and Sections of this Code that a different class of violation shall be applicable.

Fire Violations

Par. 1914. Any and all acts or actions which are contrary to any provision or requirement of, and any and all failures to comply with any provision or requirement of, Section 248, Section 265, Chapter 30, Chapter 31, Chapter 32, Chapter 33, Chapter 34, Section 411, Section 414, Section 421, Section 424, Section 431, Section 434, Section 441, Section 444, Section 451, Section 454, Section 461, Section 464, Section 471, Section 474, Section 481, Section 484, Chapter 50, Chapter 51, Chapter 52, Chapter 53, Chapter 54, Chapter 55, Chapter 56, Chapter 57, Chapter 58, Chapter 59, Chapter 94 or Chapter 98, of this Code, and any and all acts or actions which are contrary to, and any and all failures to comply with, any provision of any order, requirement, decision or notice of the Buildings Engineer or any other person, board, department, bureau, commission or other agency having jurisdiction, relative to any provision or requirement of the aforesaid Chapters and Sections of this Code, shall be and constitute a Fire Violation, except and unless it is specifically provided in the aforesaid Chapters and Sections of this Code that a different class of violation shall be applicable.

Administrative Violations

Par. 1916. Any and all acts or actions which are contrary to any provision or requirement of, and any and all failures to comply with any provision or requirement of, Chapter 10, Chapter 11, Chapter 12, Chapter 13, Chapter 14, Chapter 15, Chapter 16, Chapter 17, Chapter 18, or Chapter 19, of this Code, and any and all acts or actions which are contrary to, and any and all failures to comply with, any provision of any order, requirement, decision, or notice of the Buildings Engineer or any other person, board, department, bureau, commission or other agency having jurisdiction, relative to any provision or requirement of the aforesaid Chapters of this Code, shall be and constitute an Administrative Violation, except and unless it is specifically provided in the aforesaid Chapters of this Code that a different class of violation shall be applicable.

Technical Violations

Par. 1917. Any and all acts or actions which are contrary to any provision or requirement of, and any and all failures to comply with any provision or requirement of, Chapter 20, Chapter 21, Section 251, Section 254, Chapter 27, Section 290, Chapter 40, Section 410, Section 412, Section 413, Section 418, Section 420, Section 422, Section 423, Section 428, Section 430,

Section 432, Section 433, Section 438, Section 440, Section 442, Section 443, Section 448, Section 450, Section 452, Section 453, Section 458, Section 460, Section 462, Section 463, Section 468, Section 470, Section 472, Section 473, Section 478, Section 480, Section 482, Section 483, Section 488, Chapter 61, Chapter 62, Chapter 63, Chapter 64, Chapter 65, Chapter 66, Chapter 67, Chapter 68, Chapter 69, or Chapter 78, of this Code, and any and all acts or actions which are contrary to, and any and all failures to comply with, any provision of any order, requirement, decision, or notice of the Buildings Engineer or any other person, board, department, bureau, commission or other agency having jurisdiction, relative to any provision or requirement of the aforesaid Chapters and Sections of this Code, shall be and constitute a Technical Violation, except and unless it is specifically provided in the aforesaid Chapters and Sections of this Code that a different class of violation shall be applicable.

Miscellaneous Violations

Par. 1919. Any and all acts or actions which are contrary to any provision or requirement of, and any and all failures to comply with any provision or requirement of, Chapter 22, Section 291, Section 295, Section 296, Section 298, Section 419, Section 429, Section 439, Section 449, Section 459, Section 469, Section 479, Section 489, Section 493, Section 494, Section 495, or Section 499, of this Code, and any and all acts or actions which are contrary to, and any and all failures to comply with, any provision of any order, requirement, decision, or notice of the Buildings Engineer or any other person, board, department, bureau, commission or other agency having jurisdiction, relative to any provision or requirement of the aforesaid Chapters and Sections of this Code, shall be and constitute a Miscellaneous Violation, except and unless it is specifically provided in the aforesaid Chapters and Sctions of this Code that a different class of violation shall be applicable.

SECTION 192

PENALTIES FOR VIOLATIONS OF CODE

Penalties for Safety Violations

Par. 1922. Any and every person, firm or corporation who commits a Safety Violation shall be guilty of a misdemeanor and, upon conviction thereof in any court of competent jurisdiction, shall be fined not less than $50.00 nor more than $100.00. Every such person, firm or corporation shall be deemed guilty of a separate offense for each and every day, or any part thereof, that any such violation continues.

Penalties for Health Violations

Par. 1923. Any and every person, firm or corporation who commits a Health Violation shall be guilty of a misdemeanor and, upon conviction thereof in any court of competent jurisdiction, shall be fined not less than $25.00 nor more than $100.00. Every such person, firm or corporatiton shall be deemed guilty of a separate offense for each and every day, or any part thereof, that any such violation continues.

Penalties for Fire Violations

Par. 1924. Any and every person, firm or corporation who commits a Fire Violation shall be guilty of a misdemeanor and, upon conviction thereof in any court of competent jurisdiction, shall be fined not less than $25.00 nor more than $100.00. Every such person, firm or corporation shall be deemed guilty of a separate offense for each and every day, or any part thereof, that any such violation continues.

Penalties for Administrative Violations

Par. 1926. Any and every person, firm or corporation who commits an Administrative Violation shall be guilty of a misdemeanor and, upon conviction thereof in any court of competent jurisdiction, shall be fined not less than $5.00 nor more than $100.00. Every such person, firm or corporation shall be deemed guilty of a separate offense for each and every day, or any part thereof, that any such violation continues.

Penalties for Technical Violation

Par. 1927. Any and every person, firm or corporation who commits a Technical Violation shall be guilty of a misdemeanor and, upon conviction thereof in any court of competent jurisdiction, shall be fined not less than $10.00 nor more than $100.00. Every such person, firm or corporation shall be deemed guilty of a separate offense for each and every day, or any part thereof, that any such violation continues.

Penalties for Miscellaneous Violations

Par. 1929. Any and every person, firm or corporation who commits a Miscellaneous Violation shall be guilty of a misdemeanor and, upon conviction thereof in any court of competent jurisdiction, shall be fined not less than $5.00 nor more than $100.00. Every such person, firm or corporation shall be deemed guilty of a separate offense for each and every day, or any part thereof, that any such violation continues.

SECTION 193

COLLECTION OF FEES AND CHARGES

Liability for Expenditures Made by Buildings Engineer in Elimination of Dangerous or Unsafe Conditions

Par. 1930. In any and all cases where the Buildings Engineer in the performance of his duties proceeds in accordance with the provisions of this Code to enforce any provision or provisions of this Code providing for or relating to the elimination of any safety, health or fire hazard or hazards, or the removal of any abandoned or illegally constructed building, structure or other object, and in connection therewith furnishes, or causes to be furnished, any labor or supervision or equipment or materials or does or causes to be done any work or performs or causes to be performed any operation in or on any land, building, structure or other object to eliminate any such safety, health or fire hazard or hazards, or to remove any abandoned or illegally constructed building, structure or other object, and the furnishing of or causing to be furnished such labor or such supervision or such equipment or such materials or the doing of or causing to be done any such work or the performance of or causing to be performed any such operation involves an expenditure or expenditures of money for such materials, supervision, equipment, labor, work or operation, the entire amount or amounts of such expenditure or expenditures, together with the amount or amounts of any and all costs or expenses incidental thereto, shall be and become a debt, jointly and severally, due and owing by each and every person interested in any such land, building, structure or other object to the Mayor and City Council of Baltimore, and, in addition thereto, the entire amount or amounts of such expenditure or expenditures, together with the amount or amounts of any and all costs or expenses incidental thereto, shall be and become a lien in favor of the Mayor and City Council of Baltimore upon the interests of the owners of such land or improvements, or both, and upon such land or improvements or both, in respect to which such expenditure, expenditures, costs or expenses were made.

Any and all such debts shall be immediately due and owing to the Mayor and City Council of Baltimore upon the completion of any such work or expenditure, and any and all such liens shall be in full force and effect immediately after the Buildings Engineer has notified the Bureau of Liens of the Mayor and City Council of Baltimore that a building or other structure has been posted in accordance with the provisions of this Code in connection with the elimination of any safety, health or fire hazard or the removal of any abandoned or illegally constructed building or other structure.

Collection of Debts and Liens

Par. 1931. The amounts of any and all debts or liens mentioned in Paragraph 1930 of this Code due to or in favor of the Mayor and City Council of Baltimore shall be collected or enforced in the same manner as any other debts or liens due to or in favor of the Mayor and City Council of Baltimore are collected or enforced.

Collection of Permit Fees

Par. 1934. No permits shall be issued until and after any and all fees and charges provided for by the provisions of this Code in connection with the issuance of permits have been paid.

Collection of Certificate Fees

Par. 1935. No certificates shall be issued until and after any and all fees and charges provided for by the provisions of this Code in connection with the issuance of certificates have been paid.

Collection of Inspection Fees

Par. 1936. Before any inspection provided for in this Code is made, any and all fees or charges provided for by the provisions of this Code in connection with any such inspection shall be paid; provided, however, that all fees or charges provided for in this Code for periodic inspections shall be paid on or before December 31, of each and every year when such fees are due, with 30 days grace allowed.

Collection of Miscellaneous Fees and Service Charges

Par. 1938. Any and all miscellaneous fees or charges made for services performed by the Bureau of Buildings as provided for in this Code shall be paid before any such services are performed, except when the Buildings Engineer agrees that any such services shall be performed before a bill is rendered.

SECTION 194

APPEALS

Appeals to Courts

Par. 1940. In the event that any person, firm or corporation is aggrieved by any order or decision of the Buildings Engineer, such person, firm or corporation may institute in any court of competent jurisdiction such legal proceedings as he or it may deem necessary and proper concerning any such order or decision.

Appeals to Board of Arbitration

Par. 1941 In the event that any person, firm or corporation who is either, the legal or equitable owner of any property or the duly authorized agent of any legal or equitable owner of any property or the architect, engineer, contractor or builder in charge of and responsible for the performance of any work or operation, disagrees with or is aggrieved by any order or decision of the Buildings Engineer which relates to any materials, equipment or methods of construction or performance of any work or operation at or on any land, building, structure or other object, or which relates to any matter or thing which is not specifically provided for in this Code or which relates to any matter or thing which, by the provisions of this Code, the Buldings Engineer may either approve or disapprove, such person, firm or corporation shall have the right to refer any such order or decision of the Buildings Engineer to a Board of Arbitration, as provided for by Section 194 of this Code for review and decision.

The person, firm or corporation who is desirous of having an order or decision of the Buildings Engineer reviewed shall file with the Buildings Engineer a written petition, within five days after the particular order or decision to be reviewed has been given by the Buildings Engineer, requesting that the particular order or decision be reviewed by a Board of Arbitration.

Said petition shall contain a statement or statements of any or all pertinent matter and facts involved in the controversy, the contention of the person, firm or corporation requesting the review, the name of one person who will serve as one of the members of the Board of Arbitration, an agreement to be fully and conclusively bound by any decision or decisions of the Board of Arbitration, and said petition shall be properly executed by the person, firm or corporation filing the petition. At the time the said petition is filed with the Buildings Engineer the person, firm or corporation requesting such review shall also file with the Buildings Engineer any and all pertinent data or information that he or it may care to present to the Board of Arbitration for its consideration, together with the sum of $75.00 in cash, or a certified check for said amount.

Upon the filing of a petition to review any decision or order of the Buildings Engineer, any and all work or operations which will or may be directly or indirectly affected by any such decision or order shall cease and no such work or operations shall be commenced again until and after a decision or decisions have been rendered by a Board of Arbitration and any and all terms and provisions of any such decision or decisions of a Board of Arbitration shall have been fully complied with.

In case of the existence of an emergency where life or property is in immediate danger, nothing contained in the provisions of Section 194 of this Code shall be taken or construed to estop or prevent the Buildings Engineer from proceeding as provided in Section 187 of this Code to protect such life or property.

Appointment Of Board of Arbitration

Par. 1942 Upon the receipt by the Buildings Engineer of the aforesaid petition, he shall appoint a second person to serve as one of the members of the Board of Arbitration, and the person named by the petitioner and the person named by the Buildings Engineer to serve as members of the Board of Arbitration shall select a third person to serve as one member of said Board of Arbitration, and said third person so selected shall be the Chairman of said Board.

In the event that the person appointed by the petitioner and the person appointed by the Buildings Engineer to serve on the Board of Arbitration fail to appoint a third person to serve as a member of said Board of Arbitration within five days after they receive notice of their appointment as members of a Board of Arbitration from the Buildings Engineer, said persons shall automatically cease, without notice, to be members of a Board of Arbitration, and thereupon both the said petitioner and the Buildings Engineer shall each appoint another person to serve on the Board of Arbitration in the manner aforesaid and such newly appointed members of a Board of Arbitration shall proceed to appoint a third member of said Board of Arbitration.

In any particular case if the petitioner and the Buildings Engineer have each appointed three different pairs of arbitrators to serve on a Board of Arbitration and each of said three pairs of arbitrators, in good faith, have failed to appoint a third arbitrator within a period of five days after receiving notice of their appointment as members of a Board of Arbitration, then and in that event any and all rights which the petitioner may have to have any order or decision of the Buildings Engineer reviewed by a Board of Arbitration shall terminate and cease.

Each and every person appointed to serve on a Board of Arbitration shall be a disinterested party insofar as any particular controversy is concerned and shall be, by education, training and experience, capable and fully qualified to pass on the subject matter involved in any particular controversy.

Proceedings of Board of Arbitration

Par. 1943. After a Board of Arbitration has been established as hereinbefore provided, said Board of Arbitration shall proceed to make such investigations, inspections, and to hold such hearings, all of which shall be open to the public, as they may deem necessary to obtain any and all necessary facts or information pertaining to any particular controversy.

Meetings of said Board shall be held at reasonable times upon the call of the Chairman of said Board after due notice has been given to all parties in interest. Any party in interest may appear in person or by agent or by attorney at any such hearing and present such testimony, information, data, and arguments as may be pertinent to the controversy.

Within 10 days after the Board of Arbitration has concluded its hearings, said Board shall revise or affirm, wholly or partly, or may modify, the order, requirement, decision or determination of the Buildings Engineer which had been presented to the Board of Arbitration for review and said Board shall file a written report, signed by the members of said Board, with the Buildings Engineer setting forth their decision or decisions and the reasons therefor.

The concurring vote of two or more members of the Board of Arbitration shall be necessary to revise or affirm, wholly or partly, or modify, any order, requirement, decision, or determination of the Buildings Engineer.

Authority and Power of Board of Arbitration

Par. 1944. Any and all parties to any proceedings before a Board of Arbitration shall be fully and conclusively bound by the decision or decisions of said Board in any particular case and any and all of said parties to any such proceedings shall immediately proceed to comply with the terms and provisions of such decision or decisions.

A Board of Arbitration shall make such rules and regulations as it may deem necessary for the proper conduct of any and all of its proceedings.

Nothing contained in any of the provisions of this Code shall be taken or construed as authority to any Board of Arbitration to waive, set aside or in any manner change any specific provision or provisions of this Code.

Fees And Expenses Of Board of Arbitration

Par. 1945. Every person serving on a Board of Arbitration shall receive the sum of $25.00 for his services. If the order or decision of the Buildings Engineer reviewed is reversed, each member of a Board of Arbitration shall be paid by the Mayor and City Council of Baltimore, and said sum of $75.00 deposited by the petitioner with the Buildings Engineer at the time the petition was filed with the Buildings Engineer shall be returned to the petitioner; if the order or decision of the Buildings Engineer reviewed is affirmed, each member of a Board of Arbitration shall be paid from the sum of $75.00 deposited with the Buildings Engineer at the time the petition was filed; and if the order or decision of the Buildings Engineer reviewed is partly reversed or partly affirmed or is modified, then and in that event each member of a Board of Arbitration shall be paid his fee by either the petitioner or the Mayor and City Council of Baltimore, or both, as directed by the Board of Arbitration in its decision.

The Buildings Engineer shall furnish any and all stenographic, clerical and engineering assistance that may be reasonably requested by a Board of Arbitration in connection with any controversy presented to it.

SECTION 197

COOPERATION OF OTHER DEPARTMENTS

Cooperation Of All Departments

Par. 1970. Any and all departments, bureaus, commissions and other agencies of the Mayor and City Council of Baltimore shall cooperate with the Buildings Engineer and the Buildings Engineer shall cooperate with any and all departments, bureaus, commissions and other agencies of the Mayor and City Council of Baltimore in any and all matters and things provided for by the provisions of this Code.

Cooperation of the Fire Department

Par. 1971. The Board of Fire Commissioners of Baltimore City shall report, in writing, to the Buildings Engineer any and all lands, buildings, structures or other objects, or parts thereof, or equipment contained thereon or therein, which do not comply with the provisions of this Code, when said Board has knowledge of such conditions.

Cooperation of the Health Department

Par. 1972. The Commissioner of Health of Baltimore City shall report in writing to the Buildings Engineer any and all lands, buildings, structures or other objects, or parts thereof, or equipment contained thereon or therein, which do not comply with the provisions of this Code, insofar as health matters are concerned, when the Commissioner of Health has knowledge of such conditions.

Cooperation of the Police Department

Par. 1973. The Police Commissioner and the members of the Police Department of the City of Baltimore are requested to aid and assist the Buildings Engineer to enforce the provisions of this Code.

Cooperation of the Legal Department

Par. 1974. The City Solicitor of the Mayor and City Council of Baltimore shall render any and all legal services which may be necessary to aid or assist the Buildings Engineer to enforce the provisions of this Code.

Cooperation of the Bureau of Plans and Surveys

Par. 1975. The Engineer of Plans and Surveys of the Mayor and City Council of Baltimore shall act upon all applications referred to him by the Bureau of Buildings to determine the correctness of lines, grades and general layout of any proposed construction work or operations insofar as the Mayor and City Council of Baltimore may be affected by such proposed construction work or operations.

Cooperation of the Bureau of Standards

Par. 1976. The Chief of the Bureau of Standards of the Mayor and City Council of Baltimore shall approve all applications filed in the Bureau of Buildings for the installation or construction of any scales, gasoline tanks and pumps or any other devices or equipment designed or used for weighing or measuring any materials or products which may be sold to the public before the Buildings Engineer shall issue a permit or certificate therefor.

The said Chief of the Bureau of Standards shall also make any and all tests of any and all materials or methods of construction which may be submitted to it by the Bureau of Buildings for the purpose of determining whether or not such materials or methods of construction comply with the provisions of this Code, and in connection therewith furnish to the Buildings Engineer a written report.

Cooperation of the Bureau of Highways

Par. 1977. Whenever any application is filed in the Bureau of Buildings which contemplates the construction or erection of any building, structure or other object, the whole or any part of which, or any projection therefrom, extends into, encroaches upon, or in any way affects any street, lane, alley or other public way, such application shall be approved by both the Highways Engineer of the Mayor and City Council of Baltimore and the Buildings Engineer before any permit is issued.

PART II

MISCELLANEOUS REGULATIONS

Chap. 20—Definitions and Interpretations
Chap. 21—Private Use of Streets
Chap. 22—Grading and Excavating
Chap. 23—Shoring and Underpinning
Chap. 24—Requirements During Construction
Chap. 25—Vacant and Unsafe Buildings
Chap. 26—Moving and Razing Buildings
Chap. 27—Party Walls
Chap. 29—Other Miscellaneous Regulations

CHAPTER 20

Sec. 200—General Provisions.
Sec. 201—Definitions.

DEFINITIONS AND INTERPRETATIONS

SECTION 200

GENERAL PROVISIONS

Certain words, terms and phrases contained in this Code are defined in Section 201 of this Code for the purpose of this Code, unless the contrary clearly appears from the text.

All words used in the present tense shall include the future tense. All words used in the singular number shall include the plural number. All words used in the plural number shall include the singular number. All words used in the masculine gender shall include the feminine gender and neuter gender. All words used in the feminine gender shall include the masculine gender and neuter gender.

The words "occupy" includes the words "arranged, intended or designed to be occupied." The word "used" includes the words "arranged, intended or designed to be used". The word "shall" is always mandatory, and not directory. The word "may" shall indicate permission or option. The word "may" when used to indicate an exception to any provision or requirement of this Code, shall not nullify any other provision or requirement of this Code.

Any and all references to any Parts, Chapters, Sections, Paragraphs, Tables or Diagrams mentioned in this Code refers to the several Parts, Chapters, Sections, Paragraphs, Tables or Diagrams of this Code unless reference is specifically made to some other law, ordinance, rule, regulation or other documents, specifications or papers.

Any and all references to any departments, bureaus, commissions, boards, committees or agencies mentioned in this Code refers to the several departments, bureaus, Commissions, boards, committees, agencies of the Mayor and City Council of Baltimore unless reference is specifically made to some other department, commission, board, committee or agency.

Any and all references in this Code to the Fire Department, Health Department, or Police Department shall mean the Board of Fire Commissioners, the Commissioner of Health and the Police Commissioner for the City of Baltimore, respectively.

SECTION 201

DEFINITIONS

Agent shall mean any person, firm or corporation who is responsible for the management, maintenance, operation, rental of, leasing of or sale of any property in any particular case, or who makes application for, or seeks, a permit or certificate from the Buildings Engineer on behalf of the owner of any property in any particular case, or who in any other way represents the owner of any property in any particular case.

Alley Line shall mean the line separating an alley from a premises or lot.

Alteration shall mean any work or operation, on, in, around, or at a building or other structure or equipment which changes its situation, place, interior arrangement, height, volume, area, structural parts, type, or class of occupancy, or changes the material of any part of a building or other structure.

Amusement Device shall mean a device used to convey persons in any direction as a form of amusement.

Apartment shall mean a room or group of rooms occupied as a housekeeping unit and equipped with a kitchen sink and cooking facilities.

Approved shall mean approved by the Buildings Engineer, unless otherwise noted.

Approximately at Right Angle—Walls designated as "approximately at right angle" to a line, wall or plane, shall be construed to mean and include any wall whose exposed face forms an angle of not less than 80 degrees nor more than 100 degrees with the line, plane or the exposed face of the other wall.

Arcade shall mean a covered way located within the building lines of a lot or parcel of land on which a building or other structure is located and connecting two or more public ways.

Area, when not otherwise qualified, shall mean an open subsurface space adjacent to a building for lighting or ventilating cellars or basements. Covered areas shall mean areas covered with a grating or other cover at sidewalk level.

Area of Buildings shall mean the area of the maximum horizontal projection of a building or structure, not including open balconies, open porches, exterior open stairs, exterior steps, or exterior ramps.

Areaway shall mean an open subsurface space adjacent to a building serving as an entrance to the basement or cellar of said building.

Assembly Room shall mean a hall or room in which persons may assemble for conventions, meetings, or to hear or see theatricals, moving pictures, concerts, lectures or similar performances.

Attic, or Attic Story shall mean a space situated wholly or partly above the eave line of a slanting roof, and not used for human occupancy.

Auditorium shall mean the same as Assembly Room.

Automatic Fire Door shall mean a fire door which will close when the closing device is exposed to heat or fire.

Auxiliary Framework shall mean a structural framework serving or supporting machinery or equipment and not connected permanently to the structural members of a building.

Back Filling shall mean the replacement of all or part of any material removed from an excavation.

Balcony. See Interior Balcony and Exterior Balcony.

Basement shall mean a story in a building or other structure which is below the main entrance floor.

Bay shall mean any enclosed projection having a total width of not more than 12 feet and constructed on a rectangular, polygonal, or curved plan, projecting not more than 7 feet from the exterior wall of a building and supported on the ground.

Building shall mean a unit edifice, structure, or construction of any kind located or proposed to be located on a single plot or parcel of land.

Building Line shall mean a line formed by the intersection of the outside face of the exterior walls with the ground, except the walls facing courts.

Bulkhead shall mean an enclosed structure erected on the roof of a building and serving solely as an access to the roof.

Buttress shall mean a portion of a wall projecting from the wall and serving as a lateral support or to resist the thrust of arches.

Cast Stone shall mean a precast masonry unit made of Portland cement and special stone aggregate.

Ceiling shall mean sheathing or furring suspended from or attached to the underside of floors or roofs, which does not form a structural part of a floor or roof, or shall mean the underside of floors or roofs.

Ceiling Height shall mean the clear distance between a floor and a horizontal plane above, which extends over not less than 75 per cent of the floor area.

Cellar shall mean the lowest space or spaces in a building located under the basement.

Chimney shall mean a vertical or near vertical structure serving to remove the gases of combustion.

Combustible Material shall mean all materials which are not incombustible and which will ignite or actively support combustion.

Construction shall mean any or all work or operations necessary or incidental to the erection, building, assembling, installing or equipping of buildings, structures, devices or parts thereof. It shall also mean the finished product of any such work or operations.

Composite Construction shall mean a construction or structure in whose members two or more materials share the stresses, except reinforced concrete or gypsum.

Corridor shall mean an enclosed passageway.

Court shall mean any spaces open to the sky in or between buildings or parts of buildings or other structures to provide light and air for windows in such buildings.

Inner Court shall mean courts which have neither end open to a street, alley, public way, park, yard, court, or other similar permanently open space not less than 15 feet wide.

Outer Court shall mean courts which have only one end open to a street, alley, public way, park, yard, court or other similar permanently open space not less than 15 feet wide.

Through Court shall mean courts which have both ends open to a street, alley, public way, park, yard, court or other similar permanently open space not less than 15 feet wide.

Curb shall mean the legally established elevation of the top of a curb which separates a sidewalk from a driveway. All measurements shall be made from the outer face of curb nearest the driveway.

Dead Load shall mean the weight of walls, fixed partitions, floors, roofs, structural framework, and all other permanent construction entering into and becoming a part of a building or other structure.

Dimension of Timber where given in this Code, shall mean nominal dimensions as used in the trade, unless otherwise noted.

Display Window shall mean a show window.

Dormer shall mean a projection from a slanting roof serving to accomodate a window.

Duct shall mean equipment constructed to convey air, gases, vapors or dust.

Excavating shall mean the removal of earth, rock or other materials from a fixed or established grade.

Exhibition Hall shall mean a building or a part thereof generally used or designed to be used for the display of materials or manufactured products.

Exit in general, shall mean a way out from any point in a building to a street or other public thoroughfare at least 30 feet wide.

Exit from a story or room shall mean an exit beginning at the walls, partitions or floor enclosing that story or room.

Exit from a floor area shall mean an exit serving that area and beginning at the boundaries of such area, or at a point where the exit leaves such area.

Exterior Balcony shall mean an open platform projecting from an exterior wall and supported entirely therefrom.

Exterior Shaft shall mean a shaft on the outside of a building and separated therefrom by an exterior wall of the building.

Facing. Walls designated as "facing" a line, wall or plane, shall be construed to mean and include any wall whose exposed face forms an angle of less than 80 degrees, measured outward, with the line, plane, or the exposed face of the other wall.

Filling Station shall mean a premises primarily used or arranged or designed to be used, to supply motor fuel to the fuel tanks of motor vehicles.

Fire Area shall mean a portion of a story separated from the other portions of a story by fire walls or shall mean the whole story where no such walls exist.

Fire Division shall mean a portion of a building entirely separated from the rest of the building by fire-division separations.

Fireproofed shall mean protected to resist the damaging effects of fire, in accordance with the requirements of this Code for such construction.

Fire-Resistive Construction shall mean such construction or assembly of materials which will temporarily resist the damaging effect of fire and is in accordance with the requirements of this Code for such construction.

Fire Shutter shall mean a device protecting an opening against the passage or spread of fire and constructed in accordance with the requirements of this Code.

First Floor shall mean the main entrance floor.

First Story shall mean the space between the main entrance floor and the next floor above.

Fixed Partition shall mean a partition which cannot be removed without demolishing it.

Flammable Material shall mean any material which will readily ignite and burn when exposed to a temperature of 225 degrees Fahrenheit for less than 5 minutes.

Flat Roof shall mean a horizontal roof or a roof having a slope not over 4 inches to the foot.

Flat Slab shall mean a concrete slab reinforced in two or more directions, without beams or girders to transfer the loads to supporting columns.

Floor Area shall mean a definitely limited or enclosed portion of a floor.

Flue shall mean an enclosed pipe, duct or passageway used only for the transmission of heat or the products of combustion.

Footing shall mean that part of a structure or building which rests directly on the foundation and serves to transmit the loads upon the foundation.

Foundation shall mean: (a) soil prepared to support a building or structure; (b) the cut-offs of piles in place; and (c) the top of caisson piers.

Foyer shall mean a small lobby usually located near the mean entrance of a building.

Front or Frontage shall mean that side of a lot abutting on a street or way and ordinarily regarded as the front of the lot, but it shall not be considered as the ordinary side line of a corner lot.

Garage shall mean a building or enclosure in which motor vehicles containing fuel in their tanks are stored or housed.

Girder shall mean a beam which supports columns or other beams directly or indirectly.

Grade shall mean the rate of rise or fall of a surface.

Grading shall mean the cutting and filling necessary to bring the ground surface to a predetermined fixed grade.

Ground Floor shall mean a floor which rests directly on the ground.

Ground Level shall mean the surface of the finished ground, or of the natural ground where no grading of the ground is contemplated.

Hall shall mean same as auditorium.

Hallway shall mean a passageway closed on both sides, corridor, foyer or other room used as a means of egress in exits.

Hard Wood shall mean any wood whose specific gravity is 0.5 or more, based on the weight of the completely dry wood.

Hatch or Hatchway shall mean an opening in a floor, platform or other horizontal structure, through which openings persons or materials may pass or be passed.

Height of a Building shall mean the vertical distance from the top of the curb or the general ground level, at the main entrance, to the mean elevation of the top of the parapet wall over the main entrance or to the average roof elevation, whichever is greater. Where a building has two or more main entrances, the height of the building shall be the average of the heights at all main entrances. Where the mean elevation of the curb or ground level at the rear of a building is 15 feet or more below the top of the curb or the general ground level at the main entrance, the height of the building shall be measured from the mean elevation of the top of the curb or the ground level at the rear of the building to the mean elevation of the top of the rear parapet wall or to the average roof elevation. Penthouses, towers, cupolas, and other similar roof structures used only as ornaments or for the mechanical operation of a building shall be excluded in determining the official height of a building.

Height of a Wall shall mean the average height measured between two vertical lateral supports.

Hereafter shall mean the time after the passage of this Code.

Heretofore shall mean the time prior to the passage of this Code.

Human Occupancy shall mean the use of any building, room or space in which any person does, or is required to, remain for continuous periods of two hours or more, or for such periods which will amount to 4 or more hours out of 24 hours.

Incombustible Material shall mean any material which will not ignite nor actively support combustion in a surrounding temperature of 1200 degrees Fahrenheit during an exposure of 5 minutes.

Inflammable Material shall mean the same as flammable.

Interior Balcony shall mean an intermediate floor area with seating accommodations extending only over a portion of an assembly room.

Lateral Force shall mean any horizontal force or any horizontal component of a force.

Lavatory shall mean a fixed wash bowl equipped with plumbing.

Live Load shall mean the weights, other than dead loads, to be supported by the floors, roof, and other parts of a building or structure.

Living Room shall mean any room in a dwelling used for living purposes not including kitchens, bathrooms, toilets, bedrooms, laundries and storerooms.

Lobby shall mean a space for temporary assembly located as a means of egress in a required exit from a building.

Lounge shall mean a rest room, smoking room, or other similar space for temporary assembly.

Lot shall mean a parcel or portion of land now or hereafter laid out and included within certain fixed lines.

Corner Lot shall mean a lot of which at least two intersecting sides abut for their full length upon a street.

Depth of Lot shall mean the dimension measured from the front of the lot to the extreme rear line of the lot. In case of irregularly shaped lots, the mean depth shall be taken.

Interior Lot shall mean a lot other than a corner lot.

Through Lot shall mean an interior lot having frontage on two streets.

Main Entrance Floor shall mean that floor of a building which is directly accessible through the main entrance of the building.

Masonry shall mean any construction composed of units of stone, solid or hollow brick, burned clay, tile, solid or hollow concrete blocks, gypsum blocks or tile, or any incombustible units, bonded together with mortar. It shall also mean plain concrete and poured gypsum construction.

Mezzanine Floor shall mean an intermediate floor in a story.

Movable Partition shall mean a partition which can be moved and re-erected without demolishing it.

Now shall mean the time of the passage of this Code.

Oriel shall mean an enclosed projection containing a window or windows entirely supported from the wall of the building.

Owner shall mean any person, firm, corporation, guardian, conservator, receiver, trustee, executor, or other judicial officer who owns, holds or controls the whole, or any part, of the title to any property.

Partition shall mean an interior non-bearing wall one story or less in height, dividing a floor area.

Party Wall shall mean a wall used or adapted for joint service between two properties.

Passageway shall mean a continuous open or closed way kept clear for use as an exit.

Penthouse shall mean an enclosed accessory structure or structures not over one story high, erected on the roof of a building or other structure, and which occupies in the aggregate less than 25 per cent of the roof area.

Person shall mean a corporation, co-partnership, firm or individual.

Pilaster shall mean an offset extending for the full height of a wall, projecting at least 4 inches from the face of the wall.

Plot shall mean a lot.

Power Rooms shall mean rooms containing a motor, an engine or other prime mover of more than 5 horsepower rating.

Premises shall mean a lot, a group of lots, a building, group of buildings or parts thereof, considered as a unit, devoted to a certain use or occupancy, including the necessary and customary accessory buildings, and open spaces required by this Code, and the open spaces used in connection with the buildings.

Private Residence shall mean a dwelling containing not more than one apartment, and which is occupied or intended to be occupied exclusively by one family and household help.

Property Line shall mean the line separating two adjacent premises or lots.

Public shall mean open to common use without reference to ownership.

Public Hallway shall mean a hallway accessible to all occupants of a building.

Repairs shall mean any work or operation on, within or about a building or structure, necessary for its maintenance and which does not change the construction and material sufficiently to constitute an alteration.

Roofing shall mean the shingles, tiles, composition, sheet metal covering or other waterproof protection on top of a roof.

Self-Closing Door shall mean a door equipped with a device which will keep it shut when not in use.

Sidewalk Level shall mean the average elevation of the sidewalk between the curb and the building line or of the paved width thereof.

Shaft or Shaftway shall mean the vertical space through a series of openings directly above each other in the successive floors, or a floor and a roof of a building.

Show Window shall mean a window opening, with all necessary parts, used exclusively for the display of merchandise or advertising matter.

Sidewalk shall mean all that area of a street, alley, or other public way which is located between the curb line and the street line, alley line or the line of any other public way, whichever is applicable.

Sign shall mean any structure, device or material used for the display of letters and figures for advertising, announcements, instruction or direction, and attached to buildings, structures, or isolated supports.

Swinging Sign shall mean a sign that can be swung in a horizontal plane flat against the building.

Skylight shall mean any window, cover or enclosure, or any combination of them, placed above a roof opening for the admission of light.

Soil shall mean any inorganic material except water in a geologic formation, in its natural state and location.

Spire shall mean the high tapering roof of a steeple or tower, including the space under such roof.

Steeple shall mean that part of a tower used for ornamental purposes only, including the spire placed thereon.

Steps shall mean flights of stairs of less than 6 risers.

Story shall mean the space between the levels of two consecutive finished floors or between the level of a finished floor and the top of roof beams directly above. In a building, in case any floor or the combined area of floors at any one level extends over less than 50 per cent of the horizontal area included within the outside walls at that level, such floor shall not be considered as delimiting a story. See also "attic story."

Street shall mean any avenue, alley, lane, place, boulevard, terrace, or other public way 30 feet or more in width.

Street Line shall mean the line separating a street or alley from an adjoining lot or premises.

Structure shall mean a building, framework, or any part thereof, such as walls, floors, platforms and roofs, and any construction whether occupied or not, erected on public or private property, or on, above, or below a public thoroughfare.

Stucco shall mean a material used in a plastic form which can be troweled to form a hard covering for exterior walls or other exterior surfaces of any building or structure.

Tenancy shall mean a part of a building occupied by one tenant.

Tenant shall mean a person, persons, co-partnership, firm or corporation occupying or using a building, premises or any part or parts thereof.

Terra Cotta shall mean a baked clay unit used for architectural decoration, facing or veneering of walls.

Theater shall mean a building or any part thereof, generally used or designed to be used for the giving of operatic or dramatic performances or cinema productions or both.

Tier shall mean the level or surface of a mezzanine floor, balcony, platform, grandstand, similar construction or the supporting beams thereof.

Toilet Room shall mean an enclosed space containing a water closet or urinal equipped with plumbing.

Trap Door shall mean any door protecting an opening in a floor or roof.

Underpinning shall mean the masonry or reinforced concrete construction required to extend a wall or footing of a wall or any part thereof to a lower level.

Vault shall mean, unless otherwise qualified, a covered space or room below the ground level or sidewalk, and connected to a building or structure as an integral part thereof.

Vertical Opening shall mean an opening in a horizontal or near horizontal plane.

Volatile Liquid shall mean a liquid which will vaporize readily at 70 degrees Fahrenheit.

Volume of a Building shall mean the actual cubical contents of that part of a building which is above the ground or sidewalk level, including the exterior walls, but not including open balconies, open porches or platforms.

Wall:

Apron Wall shall mean that part of a panel wall which is between a window sill and the floor directly below.

Bearing Wall shall mean a wall, directly or indirectly, supporting loads from floors, roofs or loads other than its own weight.

Curtain Wall shall mean an exterior non-bearing wall built around a framed structure, but not supported by the framework, except laterally.

Exterior Wall shall mean all outside walls enclosing a building or other structure.

Fire Wall shall mean a wall constructed to prevent the passage or spread of fire.

Foundation Wall shall mean a wall or the portion of a wall which rests directly on the foundation and extends up to the ground level, and whose face is in contact with the soil.

Interior Wall shall mean a wall or portion of a wall which subdivides a building or other structure.

Non-Bearing Wall shall mean a wall which supports only its own weight.

Panel Wall shall mean a non-bearing wall supported on a structural member in each story.

Parapet Wall shall mean a wall extending above the finished roof.

Party Wall. See "Party Wall".

Spandrel Wall shall mean all walls supported on spandrel beams.

Width of Street shall mean the average of the distances between the street lines between two intersecting streets.

Writing shall mean printing, typewriting, handwriting in ink, photostating, photo-reproducing, or other reproducing processes which cannot be erased and which will not fade.

Yard shall mean the clear, unoccupied space on the same lot with a building.

Front Yard shall mean a clear, unoccupied space on the same lot with a building, extending across the entire width of the lot and situated between the front line of the building and the front line of the lot.

Rear Yard shall mean a clear, unoccupied space on the same lot with a building, extending across the entire width of the lot and situated between the rear line of the building and the rear line of the lot.

Side Yard shall mean a clear, unoccupied space on the same lot with a building and extending for the full length of the building between the building and the side lot line.

CHAPTER 21

PRIVATE USE OF STREETS

Sec. 210—General Regulations for Private Use of Streets.

Sec. 212—Uses Requiring Ordinances.

Sec. 213—Permanent Projections in Streets.

Sec. 214—Removable Projections in Streets.

Sec. 215—Detachable Projections in Streets.

Sec. 216—Portable Projections.

Sec. 218—Temporary Private Use of Streets.

SECTION 210

GENERAL REGULATIONS FOR PRIVATE USE OF STREETS

Scope of Regulations for Private Use of Streets

Par. 2100. The provisions contained in Chapter 21 of this Code set forth the extent to which any person, firm or corporation may use any street, alley or other way open to the use of the public or proposed or intended to be opened to the use of the public.

Authority For Private Use of Streets

Par. 2101. No street, highway, alley or other public way shall be used by any person, firm or corporation for a private purpose unless such person, firm or corporation has first secured permission and authority to so do by an ordinance of the Mayor and City Council of Baltimore or by a minor privilege permit issued by the Board of Estimates of the Mayor and City Council of Baltimore, or by a permit issued by the Highways Engineer of the Mayor and City Council of Baltimore, or by a permit issued by the Mayor of Baltimore City, whichever may be applicable in any particular case.

Classification of Private Uses of Streets

Par. 2102. The use of streets, alleys or other public ways for private purposes is divided into groups, in accordance with the permanence or condition of the use, as follows:

1. Uses requiring ordinances.
2. Permanent projections.

3. Removable projections.
4. Detachable projections.
5. Portable projections.
6. Permanent storage and portable structures on streets.
7. Temporary uses.

Maximum Obstructions to Sidewalks

Par. 2104. No structure, projection, object or thing located in or on a sidewalk or footway shall occupy any more of such sidewalk or footway than is permitted by the provisions of the various sections of Chapter 21 of this Code, except that a clear walkway, never less than 4 feet in width, shall always be maintained.

Unauthorized Private Use of Streets

Par. 2105. Any building, structure, projection, object or thing which has been abandoned or which has been established, constructed or erected without proper authority and which is located in, on or under a street, alley or other public way shall be immediately removed by the owner of such building, structure, projection, object or thing upon the receipt of notice by such owner from the Buildings Engineer to remove such building, structure, projection, object or thing.

In the event that the owner of any building, structure, projection, object or thing which has been abandoned or which has been established, constructed or erected without proper authority, does not reside in the City of Baltimore, State of Maryland, or the whereabouts of any such owner can not be ascertained as provided in Paragraph 1835 of this Code, then the Buildings Engineer shall post such building, structure, object or other thing in accordance with the provisions of Paragraph 1835 of this Code.

In case the owner of any such building, structure, projection, object or thing does not remove or cause to be removed such building, structure, projection, object or thing within 30 days after such owner has received the aforesaid notice from the Buildings Engineer or after such building, structure, projection, object or thing has been posted as aforesaid, the Buildings Engineer shall remove such building, structure, projection, object or thing at the cost and expense of the owner of such building, structure, projection, object or thing. The entire amount of money expended by the Buildings Engineer in connection with the removal of any such building, structure, projection, object or thing shall be a debt due by the owner of any such building, structure, projection, object or thing to the Mayor and City Council of Baltimore and shall also be a lien on the property removed as well as on the property from which any such building, structure, object or thing has been removed, and such tax and lien shall be collected as provided in Section 193 of this Code.

Prohibited Structures on Streets

Par. 2106. No sign extending or projecting more than eight inches beyond the building wall proper, shall hereafter be erected on either side of Charles Street from Baltimore Street to Mt. Royal Avenue.

Construction of Public Utilities

Par. 2107. The permanent or temporary use of any street, alley or other public way, for any private purpose whatsoever shall in no way or manner interfere with the maintenance or operation of any utility, matter or thing being operated or maintained for the benefit of the public nor with the free access to all hydrants, valves, manholes or other surface or subsurface structures or appurtenances.

Changes in Grade or Curb Line of Streets

Par. 2108. Whenever the grade or the curb line of any street, alley or other public way is established or changed, every structure, projection, object or thing in, on, over or under such street, alley or other public way shall be altered or removed at the sole cost and expense of the owner thereof, as may be required in writing by the Buildings Engineer, regardless of whether or not authority or permission has been granted by the Board of Estimates, or the Buildings Engineer, or the Highways Engineer (all of the Mayor and City Council of Baltimore) or the Mayor of Baltimore City to establish, construct or erect such structure, protection, object or thing.

SECTION 212

USES REQUIRING ORDINANCES

Franchises

Par. 2120. Any and all franchises or rights to use any street, avenue, alley or highway or other public property, except those which can be granted by the Board of Estimates or the Highways Engineer (both of the Mayor and City Council of Baltimore) or the Mayor of Baltimore City, shall be embodied in the form of, and granted by, an ordinance of the Mayor and City Council of Baltimore, as provided by Section 47 entitled "Grants of Franchises" of the Charter of Baltimore City.

SECTION 213

PERMANENT PROJECTIONS IN STREETS

Scope of Permanent Structures Projecting Into Streets

Par. 2130. Permanent structures projecting into a street, alley or other public way shall include all projections, such as steps, belt courses, cornices, show windows, bay windows, oriel windows, porticoes, areaways, vaults, sidewalk shafts, masonry balconies, built-in show cases, columns, piers, drains, drainpipes, tanks, pipe lines under sidewalks, and all other similar projections of a permanent nature which require major alterations for their removal.

Subsurface Structures Projecting Into Streets

Par. 2131. No area, areaway, cellar door and no shaft for ash hoists or sidewalk elevators, and no other similar structures shall project into any street, alley or other public way more than one-fourth of the width of the sidewalk in which any such structure is located, but in no case shall any such structure project into a street, alley or other public way more than three and one-half feet.

The center of every coal hole located in any sidewalk shall be not more than two feet from any street line.

No footing shall project into a street, alley or other public way more than six inches when they are less than 10 feet below any sidewalk or driveway level, but such footing projections may be increased two inches for each additional one foot of depth below 10 feet.

No tank of any kind shall be permitted under the surface of any street, alley or other public way.

Steps Projecting Into Streets

Par. 2132. Steps shall not project into any street, alley or other public way more than one-fourth of the width of the sidewalk on which any such steps are located, nor for more than 4 feet in any case. In no event, however, shall the clear walkway be less than that required by the provisions of Paragraph 2104 of this Code. For restrictions to this regulation refer to Paragraph 3191.

Masonry Balconies

Par. 2133. Balconies constructed of masonry or reinforced concrete shall not project into a street, alley or other public way more than 18 inches, except that if all parts of any such balcony are more than 15 feet above a sidewalk, it may then project not more than 3 feet.

Windows Projecting Into Streets

Par. 2134. Show windows, bay windows, wall cases and other similar projections shall not project into a street, alley or other public way more than one-fourth the width of the sidewalk into which such structures project, nor for more than 2 feet 6 inches in any case.

Oriel windows shall not project into a street, alley or other public way more than one-fourth the width of the sidewalk into which such windows project, nor for more than 4 feet in any case, unless all parts thereof are at least 10 feet above a sidewalk or 16 feet above a driveway.

Columns Projecting Into Streets

Par. 2135. No column, pilaster, buttress or other supporting member of a building or other structure shall project into a street, alley or other public way more than 10 inches.

Architectural Ornamentations Projecting Into Streets

Par. 2136. Architectural ornamentations projecting into a street, alley or other public way shall be governed by the following:

Cornices: No such projection shall exceed 3 feet and all parts thereof shall be at least 10 feet above a sidewalk or 20 feet above a driveway.

Belt Courses and Window Sills: No belt course or window sill which is 10 feet or less above a sidewalk level or 20 feet above a driveway level shall project more than 4 inches beyond the street line. In any case where a belt course or window sill is 10 feet or more above a sidewalk level or 20 feet or more above a driveway level, such belt course or window sill shall not project more than 2 feet beyond the street line.

Wheel Guards: No such projection shall exceed 10 inches and the height thereof shall be not more than 2 feet.

Doors and Windows Opening Into Streets

Par. 2137. Doors and windows shall not swing into the driveway of a street, alley or other public way unless all swinging parts thereof are at least 16 feet above the driveway. Doors swinging over a sidewalk shall project not more than one-fourth the width of the sidewalk, nor more than 2 feet in any case. Windows shall not swing over a sidewalk unless all swinging parts thereof are at least 10 feet above the sidewalk.

Walls In Streets

Par. 2138. Retaining walls, fences, walls and other similar masonry or reinforced concrete structures shall not be constructed in any street, alley or other public way unless and until after an ordinance of the Mayor and City Council of Baltimore has been duly enacted authorizing the construction or erection of any such structure or object.

SECTION 214

REMOVABLE PROJECTIONS IN STREETS

Scope of Removable Projections

Par. 2140. Removable projections in streets, alleys or other public ways shall include marquees, steel balconies, stationary signs, fire escapes, signs, clocks on buildings and other similar projections and encroachments requiring little or no alterations to buildings or other structures for their removal.

Marquees Projecting Into Streets

Par. 2141. All parts of marquees projecting into a street, alley or other public way shall be at least 10 feet above a sidewalk and one foot inside the curb.

Fixed Signs Projecting Into Streets

Par. 2142. All parts of fixed signs constructed as an integral part of a building and projecting into a street, alley or other public way shall be at least 10 feet above a sidewalk or 16 feet above a driveway.

Such signs projecting over a sidewalk shall be at least one-foot inside the curb line. Where there is no curb line, such signs shall not project more than 10 inches into the driveway of any street, alley or other public way which is less than 60 feet wide.

Steel Balconies Projecting Into Streets

Par. 2143. Steel balconies shall not project into a street, alley or other public way more than one foot, except when all parts of such balconies are more than 14 feet above the sidewalk, they may project not more than 4 feet.

Fire Escapes Projecting Into Streets

Par. 2144. Fire escapes shall not project more than 4 feet into any street, alley or other public way. No part of a fire escape, when not in actual use, shall be less than 14 feet above a driveway or 10 feet above a sidewalk.

Loading Platforms in Streets

Par. 2145. Loading platforms fixed in place shall not project into any street, alley or other public way.

Miscellaneous Removable Projections in Streets

Par. 2149. Removable projections not specifically provided for in this section, which are less than 10 feet above a sidewalk or 20 feet above a driveway, shall project not more than one foot into a street, alley or other public way.

SECTION 215

DETACHABLE PROJECTIONS IN STREETS

Scope of Detachable Projections

Par. 2150. Detachable projections into streets, alleys or other public ways shall include swinging and bracket signs, clocks, flagpoles, barber poles, awnings, chutes, meat racks, overhead trolleys, pipe line conveyors on sidewalks only, swinging and stationary hoist beams, canopies, storm doors, lamps and similar projections and encroachments which are easily and readily detachable.

Detachable Signs Projecting Into Streets

Par. 2151. All parts of detachable hinged, swinging, pendent, suspended, sidearm or bracket type signs projecting into a street, alley or other public way shall be at least 10 feet above a sidewalk and one foot inside the curb, or 16 feet above a driveway.

Such signs projecting over a sidewalk shall be at least one foot inside the curb line. Where there is no curb line, such signs shall not project more than 10 inches into the driveway of any street, alley or other public way which is less than 60 feet wide.

Hoists Projecting Into Streets

Par. 2152. Meat racks, overhead trollies, hoists, or similar equipment projecting into a street, alley or other public way, shall be at least 10 feet above a sidewalk or 20 feet above a driveway.

Conveyors Projecting Into Streets

Par. 2153. Detachable conveyors projecting into a street, alley or other public way shall be permitted only in connection with industrial buildings or industrial structures.

Canopies Projecting Into Streets

Par. 2154. All parts of canopies projecting into a street, alley or other public way shall be at least 10 feet above a sidewalk or 14 feet above a driveway.

Stationary Awnings Projecting Into Streets

Par. 2155. All parts of stationary canvas awnings projecting into a street, alley or other public way shall be at least 8 feet above a sidewalk and one foot inside the curb.

Storm Doors Projecting Into Streets

Par. 2156. Storm doors on Public Assembly, Private Assembly or Commercial Buildings shall not project into any street, alley or other public way. On other buildings, storm doors shall not project into any public driveway nor shall they project into a sidewalk for more than one-third the width of the sidewalk, nor for more than 3 feet 6 inches in any case.

Flagpoles Projecting Into Streets

Par. 2157. Inclined flagpoles extending from buildings shall not project more than 15 feet into any street, alley or other public way and the base of the pole shall be not less than 15 feet above a sidewalk or 20 feet above a driveway.

Projecting Lamps and Other Lighting Fixtures

Par. 2158. All parts of lamps and other lighting fixtures projecting into a street, alley or other public way shall be at least 10 feet above a sidewalk or 16 feet above a driveway. Glass globes shall not exceed 12 inches in their greatest dimension.

Miscellaneous Detachable Projections Into Streets

Par. 2159. Fire alarm boxes, siamese hose connections, emergency switch boxes and other similar mechanical equipment shall not project more than 10 inches into a street, alley or other public way.

SECTION 216

PORTABLE PROJECTIONS

Scope of Portable Projections Into Streets

Par. 2160. Portable projections in streets, alleys or other public ways shall include adjustable awnings, loading skids and other similar portable structures which are instantly removable from the building or other structure from which they project.

Adjustable Awnings In Streets

Par. 2162. All parts of adjustable canvas awnings projecting into a street, alley or other public way shall be at least 8 feet above a sidewalk and one foot inside the curb.

Clocks and Chimes In Streets

Par. 2163. All parts of clocks and chimes projecting into a street, alley or other public way shall be at least 10 feet above a sidewalk or 20 feet above a driveway.

Loading Skids In Streets

Par. 2164. Loading skids, chutes and similar loading devices extending from a building to vehicles or freight cars standing in a street, alley or other public way may be permitted by the Board of Estimates of the Mayor and City Council of Baltimore at its discretion.

Miscellaneous Portable Projecting In Streets

Par. 2169. Such miscellaneous portable projections as are not specifically restricted or limited by the provisions of this Code may be permitted to extend into a street, alley or other public way by the Board of Estimates of the Mayor and City Council of Baltimore at its discretion.

SECTION 218

TEMPORARY PRIVATE USE OF STREETS

Scope of Temporary Private Use of Streets

Par. 2180. The provisions of Section 218 of this Code are applicable to the temporary use of streets, alleys or other public ways by private persons for the erection, construction, maintenance or use of festoons, streamers, pylons and other street decorations, muslin signs, easel signs, banners, hoists, fences, scaffolding, overhead protection, storage of building materials, temporary walkways, shoring, piling and other uses for construction purposes, and all other similar temporary uses.

Temporary Banners, Festoons and Streamers Over Streets

Par. 2181. Temporary banners, festoons and streamers erected over streets, alleys and other public ways shall be placed at least 10 feet above a sidewalk or 14 feet above a driveway.

Temporary Canopies

Par. 2184. Temporary canopies projecting into or over a street, alley or other public way shall be at least 7 feet 6 inches above a sidewalk or 14 feet above a driveway.

Temporary Storage On Streets

Par. 2185. Temporary storage of materials and equipment on streets, alleys or other public ways shall be in accordance with the requirements of Section 241 of this Code and the conditions contained in the permit issued in connection with the storage of materials or equipment.

Construction Equipment On Streets

Par. 2186. Whenever any derrick, hoist, scaffold or other construction equipment is permitted to be placed or used on any street, alley or other public way, such equipment shall be confined to the area prescribed in, and shall be erected and constructed in accordance with the conditions of, the permit issued by the Highways Engineer of the Mayor and City Council of Baltimore. Any and all such equipment shall be designed, constructed, erected, maintained and operated in accordance with the provisions of this Code.

Street Protection During Construction

Par. 2187. Whenever any person uses any street, alley or other public way in connection with the performance of any work or operation, such person shall fully comply with the provisions of Chapter 24 of this Code.

CHAPTER 22

GRADING AND EXCAVATING

Sec. 220—General Provisions for Grading and Excavating.
Sec. 221—Excavating Equipment.
Sec. 222—Requirements for Grading.
Sec. 223—Requirements for Excavating.
Sec. 224—Shoring in Excavations.
Sec. 225—Excavating by Blasting.
Sec. 226—Protection Around Excavations.
Sec. 227—Backfilling.
Sec. 228—Paving Walkways and Driveways.
Sec. 229—Disposal of Excavated Materials.

SECTION 220

GENERAL PROVISIONS FOR GRADING AND EXCAVATING

Scope of Grading and Excavating

Par. 2200. Grading and excavating shall include any and all operations, for the removal of earth for the purpose of changing the existing surface of the ground by cutting down hills or filling in low places; for the removal of earth below final grade for cellars, basements, foundations, footings, tank pipe lines and other underground structures, including back filling after structures are built.

Permits Required For Grading and Excavating

Par. 2203. Grading and excavating permits shall be secured as required by the provisions of Sections 139 and 149 of this Code.

Before any grading or excavating work or operation is started on private property which requires the hauling of excavated material over a sidewalk, a permit shall be first secured from the Highways Engineer of the Mayor and City Council of Baltimore to use such sidewalk.

Notice of Grading and Excavating to Adjoining Owners

Par. 2204. Before any grading, excavating or filling operation, which will extend three feet or more in depth and which affects or may affect any property adjoining the site of any such operation is commenced, the owner of the land, lot or premises on which any grading, excavating or filling operation is to be performed shall give the owner and occupants of such adjoining property notice in writing of his intention to commence such operation.

Such notice shall set forth any contemplated changes to be made in the established grade, the depth of the proposed excavation or fill and any and all other proposed action or actions which may affect such adjoining property. A copy of all such notices, together with evidence satisfactory to the Buildings Engineer that the notifications have been received by the said owner and occupants of such adjoining property, shall be filed in the Bureau of Buildings before any permit to perform any such operation is issued.

Drainage of Graded Areas

Par. 2205. No person, firm or corporation shall change the natural ground or ground level of any lot or premises in any way which results or may result in any way changing the direct volume, distribution or velocity of the flow of water on or over any adjoining premises or the sidewalk of any street, alley or other public way.

Sidewalks and Roadways to be Supported

Par. 2206. Whenever any excavation is made at or close to the street line, alley line or other public way line of any street, alley or other public way, no part of any such excavation shall extend into said street, alley or other public way without the approval of the Buildings Engineer and the Highways Engineer of the Mayor and City Council of Baltimore.

The person causing any such excavation to be made shall, by adequate and approved means, support the adjacent sides or banks of any such excavation so that there will be no moving, settling or caving of the same and so that there will be no damage to any paving or any surface or sub-surface structures.

SECTION 221

EXCAVATING EQUIPMENT

General Requirements for Excavating Equipment

Par. 2210. All excavating equipment shall be of an approved standard make or type and any such equipment which is unsafe shall not be used.

Power Shovels

Par. 2211. The boilers of all steam shovels shall be inspected as required in Section 937.

The smoke stack of steam shovels operated within 500 feet of any combustible construction shall be equipped with a spark arrester screen having not more than one-quarter inch mesh.

SECTION 222

REQUIREMENTS FOR GRADING

Placing Fills

Par. 2222. All stumps, logs and other material subject to decay shall be removed before any filling material is placed, and no such filling material shall contain more than 10 per cent of organic matter.

Cuts At Property Lines

Par. 2223. If, when grading a lot or premises, the new grade is lowered below the surface or ground level of the adjoining property, the new grade shall slope upon an angle less than the angle of repose of the material, but never steeper than one foot vertical to two feet horizontal, to meet the grade of the adjoining property at the line, or a retaining wall in accordance with Paragraph 4992, shall be built entirely on the ground of the owner causing the grading.

Fills At Property Lines

Par. 2224. If, when grading a lot or premises, the new grade is raised above the surface of ground level of the adjoining property, the fill shall be sloped down to meet the new grade on an angle less than the angle of repose of the material but not steeper than one foot vertical to two feet horizontal and at no point shall the toe of the slope extend beyond the adjoining property line, or a retaining wall, in accordance with Paragraph 4992, shall be built entirely upon the land of the owner causing the fill to be made.

The owner of the lot or premises on which the fill is being placed shall make provisions to prevent water from flowing on the adjoining properties.

SECTION 223

REQUIREMENTS FOR EXCAVATING

Excavations Near Footings

Par. 2231. No excavation shall be carried below footing of any building or other structure unless the excavation is twice as far from the edge of the footing horizontally as the vertical distance from the bottom of the footing to the bottom of the excavation, except where such buildings or structures are underpinned as required in Chapter 23.

Excavations Exposing Utilities

Par. 2232. Whenever excavations come in contact with or expose any sewer or other drain, water or other pipe lines, ducts, or power, telephone or other electric lines or other public utilities, they shall not be disturbed until authorized by the owner of the utility.

Trench Excavations

Par. 2234. Trenches for wall footings, pipe lines, conduits, manholes, and other similar excavations shall be shored and otherwise protected as required in Section 224.

Water from Excavations

Par. 2236. Water from excavations shall not be permitted to flow over sidewalks in any case, or over adjoining property without the consent of the owner of such adjoining property.

SECTION 224

SHORING IN EXCAVATIONS

General Requirements for Shoring in Excavations

Par. 2240. The sides of all excavations shall be sheet-piled or sheeted and shored unless sloped to the angle of repose of the material, or otherwise protected as directed by the Buildings Engineer.

Construction of Shoring in Excavations

Par. 2241. Sheeting and shoring of banks in excavations shall be in accordance with the requirements in Section 232.

SECTION 225

EXCAVATING BY BLASTING

Permits for Blasting

Par. 2250. Before any blasting work or operation is performed in connection with any excavating or building operations, a proper permit shall be secured from the Highways Engineer of the Mayor and City Council of Baltimore to do or perform such blasting work or operation, and all such permits shall be issued in accordance with the laws, ordinances, rules and regulations of the Mayor and City Council of Baltimore, or any agency thereof, relating to blasting work or operations.

SECTION 226

PROTECTION AROUND EXCAVATIONS

General Requirements for Protection Around Excavations

Par. 2260. All excavations more than 10 feet in depth shall be protected at all times by the person causing the excavation to be made by erecting fences or other approved barriers, which in each case shall be approved by the Buildings Engineer. Excavations 10 feet or less in depth shall be protected in the same manner at all times, as hereinabove required, except while excavating operations are being performed.

Fences for Excavations

Par. 2261. Fences constructed around or for protecting excavated areas shall be not less than 5 feet in height and shall be constructed of wood, wire or sheet metal or other similar construction, with no openings through which a 6 inch diameter ball can be passed.

Such fences shall be so constructed that a force of 200 pounds will not deflect it more than 3 inches when applied at any point.

Protection Around Abandoned Excavations

Par. 2268. Abandoned excavations shall be fenced in or otherwise protected as required for quarry holes in Section 292.

SECTION 227

BACKFILLING

General Requirements for Backfilling

Par. 2270. Backfilling in all cases shall be done with material free from wood, rubbish, or other similar material which is subject to decay and shall be thoroughly compacted.

SECTION 228

PAVING WALKWAYS AND DRIVEWAYS

General Requirements for Walkways and Driveways

Par. 2280. Walkways and driveways located on private property shall conform to the requirements of Section 228 of this Code. Any and all paving work to be performed on streets or other public ways shall be constructed in accordance with the requirements of the Highways Engineer of the Mayor and City Council of Baltimore from whom a permit shall be secured before any such paving work is commenced.

Paving of Walkways

Par. 2281. The location, design, construction, and requirements for materials, for walkways located on private property shall be clearly shown on the drawings and in the specifications filed with the application for a permit to construct such walkways.

Paving of Driveways

Par. 2282. Except where otherwise required in Paragraph 4907, driveways located on private property shall be of any hard dustless surface approved by the Buildings Engineer.

SECTION 229

DISPOSAL OF EXCAVATED MATERIALS

General Requirements for Disposal of Excavated Materials

Par. 2290. Earth, rock or other materials, removed in grading or taken from excavations or taken or removed from any other similar operations, and which is not needed for filling or backfilling on the premises from which such materials have been removed, shall be hauled away and be disposed of at some point where the depositing of such materials is allowed.

Storage of Excavated Materials in Streets

Par. 2292. Earth, rock, rubbish or other materials removed from any premises shall not be stored upon the footway or roadway of any street, alley or other public way, unless and until a proper permit has been secured from the Highways Engineer of the Mayor and City Council of Baltimore to so do.

Excavated Materials to be Wetted

Par. 2295. Any and all dry earth or other light material located in, on or about the site of any grading or excavating operation shall be thorouhly sprinkled and wetted down to lay the dust and prevent such dry earth or other light materials from being blown about.

CHAPTER 23

SHORING AND UNDERPINNING

Sec. 230—General Regulations for Shoring and Underpinning.
Sec. 232—Shoring for Horizontal Support.
Sec. 233—Shoring for Vertical Support.
Sec. 235—Underpinning.

SECTION 230

GENERAL REGULATIONS FOR SHORING AND UNDERPINNING

Scope of Shoring and Underpinning

Par. 2300. Shoring and underpinning shall include any and all supporting, bracing or propping of excavated banks, buildings, building walls, structures or other objects, horizontally, vertically, or both, and the underpinning or extending of footings of walls, piers, columns of buildings, structures or other objects to a lower or higher level.

Special Permits for Shoring and Underpinning

Par. 2301. Before any shoring or underpinning operations are commenced on any property adjoining the site of any building operations, an Alteration Application shall be filed with, and a permit to perform any such shoring or underpinning operations secured from, the Buildings Engineer in accordance with the provisions of Section 133 and Section 143 of this Code.

Protection of Adjoining Property While Underpinning

Par. 2302. Where any underpinning is being performed, all property adjoining the site of any such underpinning operation shall be protected as required by the provisions of Section 246 of this Code.

General Design and Construction of Shoring and Underpinning

Par. 2308. All shoring and underpinning shall be designed to safely resist the loads to be supported according to the engineering principles and requirements set forth in Part VI of this Code.

Extraordinary Methods to be Employed

Par. 2309. In any case where the methods prescribed by the provisions of this Code, if followed, would not be sufficient to adequately support, retain or protect any excavation, the Buildings Engineer is hereby authorized and empowered to, and he shall, require extraordinary or special methods and precautions to be followed and employed so as to adequately and properly support, retain or protect any such excavation and any and all property adjoining or in the vicinity of the site of any such excavation operation.

SECTION 232

SHORING FOR HORIZONTAL SUPPORT

Design of Sheeting and Shoring

Par. 2321. In shoring for sheeting, the spacing of walers shall be not more than that given in the following table, unless the sheeting is designed and the design drawings are approved:

TABLE 2321T

	Distance Betwen Walers In Feet	
	3-inch wood sheeting	4-inch wood sheeting
From top of sheeting to 1st waler	4	5
From 1st waler to 2nd waler	7.5	9
From 2nd waler to 3rd waler	6	8
From 3rd waler to 4th waler	5	7
From 4th waler to 5th waler	4	6
From 5th waler to 6th waler	3	5
From 6th waler to 7th waler	3	4
From 7th waler to 8th waler		3
From 8th waler to 9th waler		3
From 9th waler to 10th waler		2

The walers and shoring supporting the sheeting shall be of such sizes that the stresses caused by the loading will not exceed those given in Section 622.

Shores shall be set at an angle of not more than 50 degrees with the horizontal, except where design drawings for shoring and sheeting have been approved.

Sheeting for Excavations in Soft Materials

Par. 2324. Whenever any excavation is made in soft earth, running sand or waterbearing materials, the banks or sides of the excavation shall be protected and supported by tight sheeting, tongue and grooved sheeting, splined sheeting or, if necessary, by an approved type of steel sheet piling with suitable and adequate horizontal bracing.

Sheeting and Shoring to be Removed

Par. 2326. Sheeting, shoring and bracing in excavations shall not be left in place, except where and as the Buildings Engineer may otherwise order. When sheeting is removed, it shall be withdrawn as the excavation is refilled and braces, shores and like supports shall not be taken out until the spaces underneath are refilled and consolidated.

Requirements for Bracing and Propping of Walls

Par. 2327. All braces and props for the lateral support of building walls shall be securely fixed at the ends to prevent slipping and shall have no unsupported length greater than 20 times their least dimensions for wood or 180 times their least radius of gyration for steel.

The ends of braces and props in contact with the walls shall be so formed or constructed as to provide for the distribution of stress.

SECTION 233

SHORING FOR VERTICAL SUPPORT

Design and Construction of Needling and Shoring

Par. 2331. Needles shall be designed as beams, and the working stresses shall not exceed the maximum stresses allowed for the material used. Shores shall be designed as required in Paragraph 2327.

One end of every needle shall be supported to resist any horizontal movement and where the structure itself does not provide this support one or both ends of the needle shall be supported on cribbing with the least dimension of the base of the cribbing not less than one-third the height.

SECTION 235

UNDERPINNING

General Requirements for Underpinning

Par. 2350. When walls or other structures are underpinned, they shall be adequately supported until the underpinning is in place and the concrete or mortar hardened sufficiently to carry the load.

Bearing Value of Soil Not to be Exceeded

Par. 2351. The size of footings under underpinning shall be not less than the footing of the wall to be underpinned and the maximum bearing value of the soil as permitted in Section 701 shall not be exceeded.

Materials for Underpinning

Par. 2352. All materials used for underpinning operations, such as beams, shoring, bracing, posts, columns, blocking, grillages, masonry, reinforced concrete, or other underpinning material shall be of at least the same quality as that required for the original structure.

Ordinary Methods of Underpinning

Par. 2355. Underpinning shall be with hard brick, thoroughly bedded in Portland cement mortar, or with concrete not leaner than one part Portland cement, two and one-half parts sand and five parts gravel or broken stone not exceeding two and one-half inches in size, with a maximum slump of six and one-half inches.

In either case, all walls or other structures shall be wedged up with brick, wedge brick or slate.

Special Methods of Underpinning

Par. 2356. Where unusual conditions require special methods of underpinning or special methods are desired for usual conditions, complete plans and specifications shall be approved by the Buildings Engineer before any permit is issued or work commenced.

The design and construction of all special methods of underpinning shall be in accordance with the requirements of this Code for similar materials and construction in so far as they are consistent and apply.

Responsibility for Underpinning

Par. 2357. Where any building, structure, wall or other object, or any part thereof, is underpinned, the person causing such underpinning to be done and his agents and employees, shall be responsible for the proper performance of such underpinning operation.

CHAPTER 24

REQUIREMENTS DURING CONSTRUCTION

Sec. 240—General Requirements During Construction.
Sec. 241—Handling and Storing Materials.
Sec. 242—Builders' Hoisting Equipment.
Sec. 243—Scaffolding.
Sec. 244—Altering and Repairing.
Sec. 245—Sidewalk and Street Protection.
Sec. 246—Protection of Adjoining Properties.
Sec. 247—Sanitation During Construction.
Sec. 248—Fire Protection During Construction.
Sec. 249—Special Safety Devices During Construction.

SECTION 240

GENERAL REQUIREMENTS DURING CONSTRUCTION

Scope of Requirements During Construction

Par. 2400. The requirements of this Chapter shall apply to the handling and storing of materials; builders' hoists and cranes, hoists and conveyors; staging, scaffolding and falsework; sidewalks and street protection; protection of adjoining properties; sanitation; fire protection during construction; construction of new buildings and other structures; additions, alterations or repairs to existing buildings; demolition, razing and moving of buildings and other structures, and all other construction work or operations.

Permits and Certificates Required

Par. 2401. For special permits for construction equipment, refer to Chapter 14.

For boiler and other mechanical certificates, refer to Chapter 15.

Fire Hydrants and Other Utilities Not To Be Obstructed

Par. 2403. Building materials, fences, temporary footways, covered sidewalks, enclosures, sheds, stands, offices, or any other temporary structures used during any construction work or other operations or activities shall not be stored, stacked, located or erected so as to obstruct or interfere with the free access to or use of any fire hydrant, siamese connection, fire alarm box, police call box, mail box, street light, water main stop, sewer manhole, gas manhole, conduit manhole, vault, gutters or drainage inlet or any other like equipment or appliance.

Anchors for Guy Ropes

Par. 2405. Iron bars, pipes, posts, dead men, or similar devices used for anchoring guy ropes, wires or cables shall not be driven or buried in any street, alley or other public way without the approval of the Highways Engineer of the Mayor and City Council of Baltimore.

Guy ropes, wires and cables shall not be anchored or attached to any building or other structure or premises other than the premises on which the equipment, appliances or object which is to be supported by such guy ropes, wires or cables is located, except with the written consent of the owner of said building or other structure or premises and with the approval of the Buildings Engineer.

Interference With Public or Private Business

Par. 2407. Construction work or other operations and activities shall at all times be executed and conducted in such a manner as to cause as little inconvenience to traffic and the public as possible.

Watchmen

Par. 2408. In all cases where any construction work or other operations or activities is or are being done, performed or conducted which is or are dangerous to the public, the Buildings Engineer may require the person doing, performing or conducting such work, operations or activities to keep a watchman on duty at the site of such work, operations or activities at any or all times.

SECTION 241

HANDLING AND STORING MATERIALS

General Requirements for Storage of Materials

Par. 2410. No materials, equipment or appliances to be used in connection with any construction work or operation shall be placed or stored in or on any street, alley or other public way unless and until a proper permit is issued by the Highways Engineer of the Mayor and City Council of Baltimore to do so, and no such materials, equipment or appliances shall be placed or stored on any private property, except on the premises where the particular construction work or operation is to be or is being performed, without the approval of the owner of such private property.

Storage of Materials on Streets

Par. 2413. Where and when permitted by the Highways Engineer of the Mayor and City Council of Baltimore, materials shall be stored, stacked and arranged to occupy as little space in any street, alley or other public way as possible, but shall not be stored within 25 feet of the intersection of any street lines or within 8 feet of the nearest rail of any railway track.

Every person placing or storing any materials, equipment or appliances on a street, alley or other public way, shall illuminate such materials, equipment or appliances at night, so as to clearly and definitely indicate the presence of any such materials, equipment or appliances.

Dressing stone, cleaning brick, wood working or other operations upon any sidewalk or driveway shall be permitted only if any such operation is entirely enclosed by tight fencing and all such operations shall be confined to the space authorized to be used for any such operation in a permit issued by the Highways Engineer of the Mayor and City Council of Baltimore.

Mixing of Mortar and Concrete

Par. 2416. Where and when permitted by the Highways Engineer of the Mayor and City Council of Baltimore, lime mortar, cement mortar or other mortar or concrete is mixed on a driveway or on paved or grassed portions of a sidewalk, such materials shall be mixed in tight wooden or metal mixing boxes, or upon a tight tongued and grooved platform of boards supported on two inch sleepers, and nailed thereto, leaving an air space underneath and properly built and protected so as to prevent any splashing or dripping on the paved or grassed portion of any driveway or sidewalk.

Disposal of Waste Materials

Par. 2417. All surplus earth, rock or debris or other waste materials taken from any excavation or resulting from any construction work or other operations or activities shall be disposed of as required by Section 229.

All rubbish and unused materials or waste materials accumulating on the upper floors of any building or other structure during the course of erection, alteration or repair of any building or structure shall be lowered to the ground level in receptacles by elevators, hoists, or in closed chutes. All such closed chutes shall be constructed as required by Paragraph 2613.

SECTION 242

BUILDERS HOISTING EQUIPMENT

General Requirements for Hoisting Equipment

Par. 2420. All builders' hoists and cranes, hoists and conveyors operated by electric motors, steam or internal combustion engines, or other power machinery, used in connection with the erection, alteration or repair of any building or other structure shall be substantially and safely constructed in accordance with the provisions of Section 242 and with the applicable requirements of Paragraph 9185 and Section 917.

Hoisting Machinery

Par. 2421. All hoisting machinery and similar equipment shall be located and arranged to avoid unnecessary hazards, and to provide ample room for the free and safe movement of the operating parts of such machinery or equipment when being operated.

All hoisting machinery and similar equipment shall be so guarded or enclosed as to exclude unauthorized persons therefrom and to protect all persons from injury. If located outside of any building or other structure, all hoisting machinery and similar equipment shall also be protected against falling objects and inclement weather.

Builders Hoists

Par. 2422. All builders hoists shall be so designed and constructed so as to comply with all of the requirements for such hoists as provided in Paragraph 9185 of this Code and before being used, all such hoists shall be approved for general use by the Buildings Engineer.

Floor openings and other spaces in any building or other structure through which temporary builders hoists or lifts operate shall be enclosed on all sides by wooden or metal guards not less than 6 feet high.

Derricks

Par. 2423. All guy cables or derricks used for the handling or erection of steel, stone or other materials or equipment weighing more than 2000 pounds shall not be less than one inch in diameter. All anchors for guy cables shall comply with the requirements of Paragraph 2405.

The base of all boom derricks shall be firmly anchored and secured against displacement.

Traveling Cranes

Par. 2424. The location, use and operation of locomotive or other types of traveling cranes and like equipment shall comply with all of the applicable requirements of Section 242.

SECTION 243

SCAFFOLDING

General Requirements for Scaffolding and Staging

Par. 2430. Scaffolding and staging shall include all trestles, temporary flooring, masons horses, ladders, and similar equipment or construction used in connection with the erection, alteration, repair, moving, razing or demolition of buildings, other structures, or other operations.

All scaffolding and staging shall be constructed of materials of adequate strength; properly erected; firmly supported; properly secured and of sufficient width and area to insure the safety of all persons thereon or in the immediate vicinity thereof.

Fixed Scaffolding

Par. 2431. Fixed scaffolding shall be designed and constructed in accordance with the structural regulations contained in Part VI of this Code to safely support the live load which it is intended to support, but in no case shall any fixed scaffolding be designed or constructed for a live load of of less than 75 pounds per square foot. Fixed scaffolding shall be built up from the ground or from a roof or other similar support and in no case shall wooden members of the scaffolding be smaller in size than those shown in the following table:

TABLE 2431T

Height from top	Uprights		Putlogs		Bracing	Anchors
	Size	Spacing	Size	Vertical Spacing	Size	Size
Feet	Inches	Feet	Inches	Feet	Inches	Inches
First 20......	3x4	5	3x4	6	1x6	2x6
Next 50......	4x4	5	3x4	6	1x6	2x6
Next 50......	4x6	5	3x4	6	2x6	2x6

All scaffolding for walls shall be anchored at putlogs or windows at the rate of one anchor for each 50 square feet of wall or less, or if the scaffolding contains a row of uprights adjacent to a wall and braced to the outer row of uprights, the scaffolding may be anchored by bolts or anchors at least equal to three-quarter inch diameter rounds and provided in an amount of at least one bolt to each 200 square feet of wall area or less.

Where standard scaffolding cannot be used, a special scaffolding shall be designed and submitted to the Buildings Engineer for approval before such special scaffolding is used.

Nothing in Paragraph 2431 shall be construed as prohibiting the use of materials other than wood for the construction of scaffolding.

Swinging Scaffolds

Par. 2432. Swinging scaffolds shall include suspended scaffolds for bricklayers, stone masons scaffolds, painters scaffolds, and all other similar scaffolds suspended from above.

Swinging scaffolds shall be designed and constructed in accordance with the requirements of the structural regulations contained in Part VI of this Code, using the following live loads:

Stone masons swinging scaffolds . 150 pounds per square foot
Bricklayers swinging scaffolds . . . 100 pounds per square foot
Painters and cleaners scaffolds . . 50 pounds per square foot
Inspection scaffolds . . . . 40 pounds per square foot

The stirrups on the platform to which the fall lines are attached shall be constructed either from steel cables or iron or steel rods of a strength sufficient to sustain one ton for each stirrup.

All swinging scaffolds shall be provided with rope or cable sway lines which shall be securely attached to the building or structure to which such scaffolds are attached.

All swinging scaffolds shall have a floor not less than one and one-half inches thick with no openings therein through which a one-inch diameter ball will pass.

All standard and patented scaffolds shall be approved by the Buildings Engineer for design and construction before being used on any building or other structure. If any rope or cable supporting or used in connection with any swinging scaffold becomes deteriorated, impaired or damaged to such an extent that its strength is reduced by more than 20 per cent, such rope or cable shall be replaced.

Guard Railings and Toe Boards

Par. 2433. All platforms of scaffolds, except those which are less than 6 feet above ground level or any permanent floor level which projects at least 3 feet beyond the scaffold, and except painters' swinging scaffolds, shall be provided with guard rails not less than 36 inches high and solid toe boards or curbs not less than 6 inches high above the platform level. Such guards and toe boards shall entirely surround the platforms, except where ramps connect with them, or where they are otherwise enclosed or guarded.

On all swinging scaffolds located over any street, alley or other public way, and on other scaffolds, if required by the Buildings Engineer, the space between the guard railing and toe boards shall be enclosed with wire netting having a mesh not exceeding one and one-half inches.

On the building side of swinging scaffolds, there shall be a rope connecting one end handrail with the other.

Life Lines on Scaffolds

Par. 2434. Life lines shall be provided for all persons on painters' scaffolds which are not provided with guard rails and toe boards. Such life lines shall be fastened to the building or other structure to which the scaffold is attached, independently of the scaffolding, and shall have a safety factor of at least three.

Temporary Stairs and Ladders

Par. 2437. All buildings or other structures 3 stories or more in height, during construction, shall be provided with temporary wooden stairs or ladders which shall be kept in good repair until the permanent stairs are installed. If temporary stairs are not installed, double ladders each not less than 2 feet wide with rungs not over one foot apart, securely fastened at top and bottom, shall be provided. Such temporary stairs or ladders shall extend upward to the story or tier being erected.

Temporary Flooring

Par. 2438. In all steel frame buildings or other steel frame structures under construction, a temporary floor covering of two-inch wooden planks or of another material having an equal strength shall be maintained on the uppermost completed tier of beams or on the tier immediately below. Such covering shall extend over the whole floor area, except for the necessary openings, which openings shall be protected by suitable guards. The provisions of this paragraph shall not apply where the permanent flooring is placed on such tiers.

SECTION 244

ALTERING AND REPAIRING BUILDINGS

Shoring When Remodeling Buildings

Par. 2441. Whenever the lower or any other portion of any wall is to be torn out in connection with the remodeling, repairing, altering or rebuilding of any building or other structure, or any part thereof, every precaution shall be taken to shore up the wall or structure above with supports of ample strength.

For shoring, needling and underpinning regulations, refer to Chapter 23.

SECTION 245

SIDEWALK AND STREET PROTECTION

Street Protection in General

Par. 2450. Whenever any building or other structure which is adjacent to any street, alley or other public way is to be erected, added to, altered, repaired, moved, razed or demolished in such a manner as might give rise to any hazard to life, limb or property, such substantial fences, barricades or hand rails as required by the Buildings Engineer shall be constructed around such building or other structure and, when required by the Buildings Engineer, temporary sidewalks, footway bridges, sheds, covered sidewalks, or such other protections as may be necessary to prevent injury to persons or property shall be constructed. Any and all of such sidewalk or street protections shall be designed and constructed so as to provide a sidewalk or driveway width as required by the Highways Engineer of the Mayor and City Council of Baltimore.

All such sidewalk or street protections shall be safely and substantially designed and constructed so as to meet with the approval of the Buildings Engineer, and all such sidewalk or street protections shall be maintained in a safe condition at all times.

If any construction work or other operation is suspended and is not resumed within a period of 60 days or if any construction work or operation is abandoned, any and all of the aforesaid sidewalk or street protections which extend into a street, alley or other public way for a distance of more than one foot shall be removed if so ordered by the Highways Engineer of the Mayor and City Council of Baltimore.

Enclosing Building Sites

Par. 2451. Fences enclosing building sites on which any construction or demolition operations are being performed shall be solid and tight for their full length, except for such openings, which shall be provided with sliding doors or hinged doors swinging inward, as may be necessary for the proper execution of the work.

Such fences, unless otherwise provided, shall be at least 7 feet in height, and shall, where practicable, be erected before any work is commenced.

Temporary Footways Adjacent to Fences

Par. 2453. Whenever a temporary fence or enclosure is within 4 feet of a curb line, a temporary plank footway not less than 4 feet in width, with suitable enclosed sides or smooth guard and hand rails not less than 42 inches in height shall be provided just outside of said fence or enclosure.

The floor of such footways shall be as required for footway bridges in Paragraph 2455.

Covered Sidewalks

Par. 2454. Covered sidewalks shall, where possible, be constructed before any operation is commenced and be of sufficient strength to protect the public during construction from falling materials, and such coverings shall remain in place from the commencement of the work until the completion of all exterior portions of the building or other structure, or in case of demolition, until all operations are completed.

Wooden roofs of such covered sidewalks shall be made of boards not less than 2 inches in thickness, supported by well-braced framework, and all roofs shall be designed to support a live load of at least 250 pounds per square foot.

Whenever the wooden roof of any covered sidewalks is used as a platform for handling or storing building materials or equipment, it shall be not less than 3 inches thick. The roof of covered sidewalks shall extend for the full width of the walkway. It shall have a substantial and fully enclosed guard on all sides not less than 36 inches high.

Temporary Footway Bridges

Par. 2455. Should it be necessary to excavate in or under any sidewalk in connection with any construction operations, a suitable footway bridge shall be provided for the safety of pedestrians. Such footway bridges shall not be more than 8 feet above grade, not less than 4 feet in width, and of ample strength. The location of such bridges between the building line and the curb shall be subject to the approval of the Highways Engineer of the Mayor and City Council of Baltimore. The open sides of temporary footway bridges shall have a guard railing at least 42 inches in height.

The floor of such bridges shall be supported on a well-braced framework and shall be designed for a live load of at least 100 pounds per square foot. Where such floors are of wood they shall be not less than 2 inches in thickness.

Temporary footway bridges shall have convenient and safe ramps or stairways at each end, with the same guard railings as are required for the bridge.

Ramps or steps extending unto the sidewalks of any adjoining buildings shall not interfere with the free entry to such buildings.

Where the space under elevated temporary footway bridges is used for receiving or removing materials, proper approved guards shall be maintained.

Lighting

Par. 2457. All temporary sidewalks, covered sidewalks, or temporary footway bridges, shall be kept well lighted continuously between sunset and sunrise and at all other times when natural light is inadequate for public safety.

Property Not To Be Injured

Par. 2458. No street, alley or other public way, or any part thereof, shall be moved, injured, damaged, changed, altered or disturbed in any manner without a proper permit having been first secured from the Highways Engineer of the Mayor and City Council of Baltimore, and no property located in, on, over or under any street, alley or other public way shall be moved, injured, damaged, changed, altered, used or disturbed in any manner unless and until after the consent of the owner of any such property has been secured, in connection with the construction, erection, alteration, repair, demolition, razing or moving of any building or other structure.

SECTION 246

PROTECTION OF ADJOINING PROPERTIES

General Requirements for Protecting Adjoining Properties

Par. 2460. During the entire time that any land, building or other structure is being constructed, erected, altered, repaired, demolished, razed, moved, excavated, graded, filled or underpinned, any and all adjoining land, buildings or other structures or premises, or every part thereof, which may be affected by any work being performed in connection with any of the above-mentioned operations, shall be sufficiently and adequately supported and protected to prevent damage or injury to any property or persons by the owner of the land, building or other structure or premises in or on which any of the above-mentioned operations are being performed, and his contractors, agents or employees.

Before any of the above-mentioned operations are commenced any and all notices required to be given to the owners of properties adjoining the site of any of such operations shall be given as required and in accordance with the provisions of Chapter 14 and other applicable provisions of this Code.

Liability of Owner of Operations

Par. 2461. When any person, firm or corporation enters upon any property adjoining the premises where any work or operations is or are being done or performed to sufficiently and adequately support or protect such adjoining property or the occupants thereof against damage or injury such person, firm or corporation shall be legally liable for any and all damages or injuries which he or it, or his or its contractors, agents or employees, may do to such adjoining property or any property located therein or thereon or any of the occupants thereof.

Bond for Operations on Adjoining Property

Par. 2462. Before any person, firm or corporation enters upon any property adjoining the premises where any work or operation is or are being done or performed to sufficiently and adequately support or protect such adjoining property or the occupants thereof against damage or injury, the owner of such adjoining property may require the owner of the property on which any work or operations is or are being done or performed and his contractors, agents or employees, to furnish a good and sufficient surety bond, executed by a surety or sureties who is or are financially responsible, in such an amount of money as may be reasonable and upon such conditions as may be reasonable in any particular case in favor of the owner of such adjoining property and the occupants thereof to fully protect him and such occupants from and against any and all damages, injuries, losses, costs and expenses of every kind which he or they may sustain in connection with or as a result of any negligence of the owner of the property on which any work or operations is or are being done or performed or his contractors, agents or employees while in or about constructing, erecting, placing, maintaining or removing any structure or other object or doing any work or performing any operation to successfully and adequately support or protect any such adjoining property or the occupants thereof against damage or injury.

Refusal of Access to Adjoining Property

Par. 2463. In any and all cases where the owner of any property on which any building, construction, erection, repair, demolition, razing, moving, excavating, grading, filling or underpinning operations are being or are about to be performed, or his contractors, agents or employees, can not sufficiently and adequately support or protect any property adjoining the site of any such operations, or the occupants thereof, against damage or injury, except by going upon the property adjoining the site of any such operations and the owner of any property adjoining the site of any such operations, after having been notified relative to such operations as provided in this Code, refuses to grant permission to the owner of the property upon which any of the aforesaid operations are being or are about to be performed or to his contractors, agents or employees, to enter upon such adjoining property for the purpose of sufficiently and adequately supporting or protecting such adjoining property or the occupants thereof against damage or injury during the time when any of the aforesaid operations are being performed, or predicates the grant of any such permission upon unreasonable terms and conditions in any particular case, or demands an unreasonable amount of bond before granting any such permission in any particular case, then, in that event, the owner of such adjoining property, at his sole cost and expense, shall sufficiently and adequately support and protect his own property and the occupants thereof against damage or injury during the entire time when any of the aforesaid operations are being performed.

If Parties Can Not Agree, Buildings Engineer Shall Decide

Par. 2464. In the event that the owner of any property on which any building, construction, erection, repair, demolition, razing, moving, excavating, grading, filling or underpinning operations are being or are about to be performed and the owner of any property adjoining the property on which any of the aforesaid operations are being or are about to be performed can not agree upon the amount of, or the financial responsibility of any surety or sureties on,or the terms and conditions of, any bond to be furnished in accordance with Paragraph 2462 of this Code, or if said parties can not agree upon, the manner or method of doing any work or performing any operation to be done or performed, or any other matter or thing, as provided in Section 246 of this Code, then the Buildings Engineer, after giving all parties interested in any particular case an opportunity to be heard, shall make a decision in any particular case which shall be binding on all parties thereto.

Buildings Engineer to Act

Par. 2465. In any and all cases where the owner of any property, adjoining any property on which any building, construction, erection, repairing, demolishing, razing, moving, excavating, grading, filling or underpinning operations are being or are about to be performed, refuses to grant permission to the owner of the property upon which any of the aforesaid operations are being or are about to be performed, his contractors, agents or employees, to enter upon such adjoining property for the purpose of sufficiently and adequately supporting or protecting such adjoining property or the occupants thereof against damage or injury during the time when any of the aforesaid operations are being performed after the owner of the property on which any of said operations are being or are about to be performed has offered in good faith to comply with the provisions of Section 246 of this Code and fails to sufficiently and adequately support or protect the property or the occupants thereof against damage or injury during the time when any of the aforesaid operations are being performed, the Buildings Engineer shall send the owner of such adjoining property a notice as provided in Section 183 of this Code.

In the event that the owner of such adjoining property fails to comply with the requirements of said notice within the time stated in said notice, the Buildings Engineer may, and he is hereby authorized and empowered to, enter upon such adjoining property and do or cause to be done any work or perform or cause to be performed any operation which may be necessary to sufficiently and adequately support or protect such adjoining property or the occupants thereof against damage or injury during the time when any of the aforesaid operations are being performed at the sole cost and expense of the owner of such adjoining property.

The entire amount of money expended by the Buildings Engineer in connection with sufficiently and adequately supporting or protecting such adjoining property or the occupants thereof against demolition or injury during the time when any of the aforesaid operations are being performed shall be a debt due by the owner of such adjoining property to the Mayor and City Council of Baltimore, and shall be a lien on such adjoining property, and shall be collected as provided in Section 193 of this Code.

Provided, however, that nothing herein contained, in cases of emergency, shall be construed to prevent or estop the Buildings Engineer from proceeding in accordance with the provisions of Section 187 of this Code, and nothing herein contained shall prevent or estop or in any manner restrict the Buildings Engineer from proceeding in accordance with any of the provisions of this Code.

Protection of Walls and Footings

Par. 2466. The procedure to be followed for protecting footing and walls of buildings or other structures adjoining any property on which any building, construction, erection, repairing, demolishing, razing, moving, excavating, grading or filling operations are being or about to be performed, by means of shoring and underpinning is prescribed in Chapter 23 and Chapter 27 of this Code.

Skylights of Adjoining Buildings

Par. 2467. All skylights of buildings or other structures on any property adjoining any property on which any building, construction, erection, repairing, demolishing, razing, moving, excavating, grading, filling or underpinning operations are being performed, shall be protected with a wire netting of not lighter than 10 gauge wire and not over one-half inch mesh, securely attached to a suitable and substantial wooden or metal framework.

Failure to Protect Adjoining Property

Par. 2469. In any and all cases where the owner of any property on which any operations are being performed, or his contractors, agents or employees, refuses or fails to sufficiently and adequtaely support and protect the property adjoining the site of such operations, or the occupants thereof, against damage or injury during the time when any opertions are being performed, or refuses or fails to continue to do so after having commenced, after having been granted permission by the owner of such adjoining property to sufficiently and adequately support and protect such adjoining property, or the occupants thereof, against damage or injury as aforesaid, the Buildings Engineer shall stop any and all work or operations being done or performed on the said property, except such work or operations as may be necessary to adequately support and protect such adjoining property, or the occupants thereof, as aforesaid, until the adjoining property or the occupants thereof has been supported and protected as provided by the provisions of this Code.

SECTION 247

SANITATION DURING CONSTRUCTION

General Sanitary Requirements During Construction

Par. 2470. Any and all building, construction, erection, alteration, repairing, moving, razing, demolition or any of the work or operation regulated by the provisions of this Code shall be done in such a manner so that no nuisance or unsanitary condition or conditions of any kind will be created.

No rubbish or waste materials shall be allowed to accumulate on the site of any of the aforesaid operations.

Provisions for Draining

Par. 2475. In any and all cases where any work or operation regulated by the provisions of this Code is being done or performed, adequate provisions shall be made to prevent the accumulation of water or other drainage on the site of any such work or operation.

SECTION 248

FIRE PROTECTION DURING CONSTRUCTION

General Requirements for Fire Protection During Construction

Par. 2480. Whenever any building or other structure is being constructed, erected, added to, altered, repaired, moved, razed or demolished, the owner of such building or other structure shall provide and maintain suitable and sufficient precautions against fire.

Temporary Standpipes During Construction

Par. 2481. Whenever any building or other structure which is being constructed or erected reaches a height of 75 feet, the owner of said building or other structure shall erect and maintain in service at all times temporary or permanent Fire Department standpipes in accordance with the provisions of Paragraph 9818 of this Code, and thereafter such standpipes shall be extended so that such standpipes shall always be within two stories of the uppermost constructed story of any such building or other structure at all times while such building or other structure is being constructed or erected.

Fire Extinguishers Required During Construction

Par. 2482. Whenever any building or other structure which is being constructed or erected reaches a height of 100 feet, at least one portable fire extinguisher of two and one-half gallons capacity shall be provided for each and every 60,000 square feet of floor area above the said 100 feet level in any such building or other structure.

Use of Salamanders During Construction

Par. 2485. Salamanders and other similar appliances or equipment containing fire when located on or in any building or other structure being constructed or erected shall not be placed within 6 feet of any wood or other combustible construction or material.

Removal of Combustible Wastes

Par. 2487. No combustible waste matter shall be allowed to accumulate in, on or about any building or other structure while it is being constructed or erected, and any and all regulations of the Board of Fire Commissioners of Baltimore City shall be fully complied with.

SECTION 249

SPECIAL SAFETY DEVICES DURING CONSTRUCTION

General Requirements for Safety Devices During Construction

Par. 2490. During the time when any building or other structure is being constructed, erected, added to, altered, moved, repaired, razed or demolished, adequate and approved safety measures and devices shall be provided and maintained by the owner of such building or other structure for the protection and safety of life, limb and property, as required by the provisions of this Code or as may be required by the Buildings Engineer.

Warning Signs

Par. 2492. In all cases during the time when any building or other structure is being constructed, erected, added to, altered, moved, razed or demolished, adequate and appropriate warning signs shall be posted in a conspicuous location at any and all points and places on the site of any of said operations, where any particularly dangerous or hazardous condition or conditions exist.

Danger Lights

Par. 2493. In any and all cases during the time when any building or other structure is being constructed, erected, added to, altered, moved, razed or demolished, illuminated red globe lamps or lanterns or other appropriate red lights approved by the Buildings Engineer shall be provided, maintained and kept lighted at all times between sunset and sunrise, on the site of any such operations at all points or places where necessary to protect life or property.

In all cases, however, in order to protect the public, such lights shall be securely and conspicuously placed at, on or in close proximity to, all pits, excavations, barricades, fences, footways, temporary sidewalks, sheds, construction equipment, materials, rubbish, waste materials, or other things or objects which are located in, on, upon or immediately adjacent to any street, alley or other public way. At least one such light shall be placed at each end of any of the aforesaid structures, objects or things, and at intermediate points on or along any one of the aforesaid structures, objects or things so that there shall be no greater distance than 50 feet between any two such lights placed on or along any one of the aforesaid structures, objects or things.

CHAPTER 25

VACANT AND UNSAFE BUILDINGS

Sec. 250—General Regulations for Vacant and Unsafe Buildings.
Sec. 251—Requirements for Vacant Buildings.
Sec. 252—Unsafe Buildings.
Sec. 254—Wrecked Buildings.
Sec. 256—Closing of Streets and Other Places.

SECTION 250

GENERAL REGULATIONS FOR VACANT AND UNSAFE BUILDINGS

Scope of Vacant, Unsafe and Dangerous Buildings

Par. 2500. Vacant buildings shall include all buildings or other structures without occupancy and from which building or other structure furniture, portable equipment and merchandise has been removed.

Unsafe buildings shall include all buildings and other structures in whole or in part, existing or in the course of construction, which have become potentially unsafe but not imminently dangerous.

Dangerous buildings shall include all buildings and other structures in whole or in part existing or in the course of construction which have become so unsafe as to be a menace to life or property.

Wrecked buildings shall include all buildings and other structures in whole or in part existing or in course of construction which have been partially dismantled or wholly or partially destroyed or damaged to such an extent that they are uninhabitable.

Dangerous conditions shall include all conditions in or upon all buildings or other structures, or premises which create a fire hazard or a menace to life or health.

Procedure for Unsafe and Dangerous Buildings

Par. 2501. Every unsafe or dangerous building or other structure, or dangerous conditions reported to, or otherwise brought to the attention of, the Buildings Engineer, shall be immediately inspected and acted on as required in Part I of this Code.

Unsafe Conditions to Be Rectified

Par. 2507. All unsafe or dangerous buildings or other structures, and all dangerous conditions located in or on any premises shall be immediately made safe or eliminated by the owner of any such buildings or other structures or premises upon the receipt of notice to do so from the Buildings Engineer.

SECTION 251

REQUIREMENTS FOR VACANT BUILDINGS

Classification of Vacant Buildings

Par. 2511. Vacant buildings shall be divided into three groups, viz:

a. Buildings temporarily unoccupied.

b. Buildings vacant for indefinite periods.

c. Buildings abandoned.

Buildings Temporarily Unoccupied

Par. 2512. All doors, windows and other openings within 8 feet of the ground or which may be readily accessible in every building or other structure which is vacant for less than one year, or temporarily unoccupied, shall be kept locked or otherwise securely fastened.

Buildings Vacant for Indefinite Time

Par. 2513. Every door, window or other opening in buildings or other structures which are vacant for one year or more shall be locked, or otherwise securely fastened, and all windows within 20 feet of the ground or which may be readily accessible shall be completely covered with a sheet metal covering of not less than 30 gauge or with such other substantial material as shall be approved by the Buildings Engineer.

Abandoned Buildings

Par. 2514. Abandoned buildings include all buildings or other structures which have been vacant for a period of one year or from which any of the usual precautions against trespassers have been destroyed or removed, and the owner of which either cannot be located or will not protect such building or other structure against trespassers.

All such buildings or other structures shall be considered as unsafe or dangerous buildings and the Buildings Engineer shall proceed in accordance with the provisions of this Code relative to unsafe or dangerous buildings or other structures.

SECTION 252

UNSAFE BUILDINGS

Closing Unsafe Buildings

Par. 2522. In the event that any building or other structure or premises does not have sufficient exits, or the fire extinguishing equipment located on or in any building or other structure or premises is not properly maintained, or any building or other structure or premises is operated or maintained in such a manner as to create a fire hazard, or any building or other structure or premises, or any part thereof, is structurally unsafe so as to be unsafe or dangerous to the occupants thereof, or if any building or other structure or premises, or any part thereof, for any other reason is unsafe or dangerous to the occupants thereof, and the owner of any such building or other structure or premises fails to comply with the requirements of the Buildings Engineer within the time allowed by said Buildings Engineer as stated in a notice to the owner of any such building or other structure by the Buildings Engineer, then, and in that case, the Buildings Engineer shall, and he is hereby authorized and empowered to, order such building or other structure or premises vacated and closed, and any and all such orders of the Buildings Engineer shall be complied with immediately.

Immediately after any such building or other structure or premises has been ordered vacated and closed, the Buildings Engineer shall, and he is hereby authorized and empowered to, post such building or other structure or premises in the same manner as is provided in Paragraph 1851 of this Code.

No such building or other structure or premises, after having been vacated and closed, shall be reopened or reoccupied until and after all of the requirements of the Buildings Engineer have been complied with.

Removal of Contents of Unsafe Buildings

Par. 2523. After any land, building or other structure has been posted as being unsafe or dangerous, no person shall enter in or upon any such land, building or other structure for any purpose, except as may be permitted by the Buildings Engineer.

SECTION 254

WRECKED BUILDINGS

General Regulations for Wrecked Buildings

Par. 2540. Any building or other structure damaged by public enemies, explosion, fire, wind, storm, rain, snow, hail or any other act of God, and for which a certificate of occupancy has been issued, may be reconstructed or restored as it existed immediately prior to the time when such building or other structure was damaged, if such reconstruction is started within one year from the date such building or other structure was damaged. If no certificate has been issued, reconstruction or restoration of any such building or other structure shall be governed by the requirements of this Code relating to dangerous and unsafe buildings.

Buildings Partially Damaged

Par. 2541. Whenever any building or structure has been damaged or destroyed by fire, collapse, decay or other cause, no remaining part or portion thereof shall be allowed to remain or be used in rebuilding such damaged building or structure without the approval of the Buildings Engineer.

SECTION 256

CLOSING OF STREETS AND OTHER PLACES

Buildings Engineer to Close Streets and Other Places

Par. 2560. Whenever any land, building or other structure, object or thing, or any condition therein or thereon endangers persons or property or any street, alley or other public way or the occupants of any adjoining property, the Buildings Engineer shall cause any such street, alley or other public way to be roped off or barricaded to prevent travel thereon, or shall cause such adjoining property to be vacated, as the case may be, to such an extent and for such a period of time as may be necessary to protect life or property.

CHAPTER 26

MOVING AND RAZING BUILDINGS

Sec. 260—General Requirements for Moving and Razing Buildings.
Sec. 261—Razing Buildings.
Sec. 262—Moving Buildings.
Sec. 265—Fire Protection When Moving or Razing Buildings.

SECTION 260

GENERAL REQUIREMENTS FOR MOVING AND RAZING BUILDINGS

General Regulations for Moving or Razing Buildings

Par. 2600. Any and all applicable provisions of Chapter 24 of this Code shall also apply to any and all work or operations being done or performed in connection with the moving, razing or demolition of any and all buildings or other structures.

Protection of Adjoining Property

Par. 2603. Whenever any building or other structure, which is attached to another building or other structure on one or more sides, is moved, razed or demolished, and any wall or walls of any such adjoining building or other structure is or are unsafe or dangerous, such wall or walls shall be laterally supported by proper bracing of suitable design and construction and in accordance with the provisions of Paragraph 2327 of this Code.

Disconnecting Water and Sewer Connections

Par. 2607. Whenever any building or other structure is moved, razed or demolished, all water, sewer, gas, electrical, steam and all other similar services to any such building or other structure shall be disconnected and capped or otherwise cared for as may be required by the owners of any such service.

SECTION 261

RAZING BUILDINGS

Scope of Razing Buildings and Other Structures

Par. 2610. The provisions of Section 261 of this Code shall apply to any and all operations performed in connection with the razing, demolishing, tearing down or otherwise putting out of existence any building or other structure.

Razing Operations Not to Cause Nuisance

Par. 2611. Any and all work done or operations performed in connection with the razing of any building or other structure, and all work done or operations performed in connection with the removal of any machinery or equipment from any building or other structure to be razed, shall be done or performed in such a manner so as not to create a nuisance in the vicinity of any such razing or removal operations. No materials, object or thing shall be allowed to fall in or on any structure, alley or other public way or on any buildings or other structures or premises. All materials, objects or things shall be well wetted down or treated to such an extent as may be necessary to prevent dust or other flyings. In the event that any such razing or moving operations are performed in violation of the aforegoing requirements the Buildings Engineer shall stop any such operations until the above-mentioned requirements are complied with.

Method of Demolition

Par. 2612. When any building or other structure is being razed, the razing operations shall be performed in about the reverse order in which any such building or other structure was erected. Provided, however, in cases where unusual conditions exist the Buildings Engineer may permit a different order of procedure to be followed.

After a building or other structure has been stripped, the walls and structural framework shall be taken down one story at a time, beginning at the top. No walls shall be thrown or be allowed to fall upon floors or other structures.

Beams, girders, trusses, heavy pieces of stone or other heavy and bulky materials or equipment shall be carefully handled in accordance with the provisions of Chapter 24 of this Code.

No wall, beam, pier, column or other supporting member shall be disturbed or weakened until all superimposed loads are entirely removed.

At least one stairway shall be kept clear and unobstructed at all times or temporary stairs or ladders provided as required in Paragraph 2437.

Removal of Material When Razing Buildings

Par. 2613. Any and all loose materials accumulating on any of the upper floors of buildings or other structures being razed shall be lowered to the ground level in receptacles by elevators or hoists or in closed chutes. All chutes shall be tight and completely enclosed. No chute shall extend in an unbroken line for more than 25 feet without suitable and substantial barriers to prevent descending materials from attaining an excessive or dangerous velocity. Every chute shall be equipped with a proper gate or stop, located at the bottom of such chute, and so constructed and arranged as to stop or control the flow of materials from the chute.

Party Walls of Razed Buildings

Par. 2614. Whenever any building or other structure is being razed all party walls forming a part of the building or other structure being razed shall be left standing, and the owner of the building or other structure being razed shall comply with the applicable provisions for requirements of Chapter 27 of this Code.

Cellar Floors In Razed or Moved Buildings to be Broken Up

Par. 2615. Whenever any building or other structure is razed or moved to another location, all basement and cellar floors of such building or other structure shall be removed or completely broken up before any filling materials are placed thereon or therein.

Sites of Razed Buildings to be Filled

Par. 2616. After any building or other structure has been razed or moved to another location, the entire site of any such razed or moved building or other structure shall be cleared of any and all debris or waste materials, and all basements, all cellars of any such razed or moved building or other structure, and all other holes or openings in or on the site of any such razed or moved building or other structure shall be properly filled up to the ground level of the site of any such razed or moved building or other structure with earth, stone, masonry or other similar sanitary and incombustible materials. All grading shall be sloped so that all water falling on the site of any such razing or moving operations will not flow over any adjoining property.

Provided, however, that in case the Buildings Engineer is satisfied, upon the presentation to him of definite proof, that construction operations for the erection of a new building or other structure will be commenced on the site where a building or other structure has been razed or from which a building or other structure has been moved within three months after the razing or moving operations have been completed, then, and in that event, the Buildings Engineer may waive the requirements of this numbered Paragraph relating to filling for a period of three months. If the requirements of this numbered Paragraph relating to filling are waived as aforesaid, then all basements or cellars of any such razed or moved building or other structure, and all other holes or openings in or on the site of any such razed or moved building or other structure, shall be protected in the same manner as is required by the provisions of Section 226 of this Code.

SECTION 262

MOVING BUILDING

Scope and General Requirements for Moving Buildings

Par. 2620. The provisions of Section 262 of this Code shall apply to any and all operations performed in connection with the moving of any building or other structure from one location to another location, whether on the same lot or from one lot to another lot.

Any building or other structure moved from one location to another location shall comply with all the provisions of this Code for new buildings or other structures, including those pertaining to foundations, foundation walls and footings.

Any and all applicable provisions of Section 261 of this Code shall also apply to any and all operations performed in connection with the moving of any building or other structure from one location to another location.

Provided, however, that the provisions of Section 262 of this Code in so far as they may be applicable to obtaining a permit from the Buildings Engineer before moving any building or other structure from one location to another location shall not apply to the mere transportation or hauling, upon any vehicle ordinarily used for that purpose, of any temporary portable building or other structure which is less than 4,000 cubic feet in volume and which is less than 12 feet wide and which is used or designed to be used as a tool box or a temporary office or a temporary shelter for a watchman or a temporary shelter for materials or equipment on construction projects or similar purposes.

Method of Moving Buildings

Par. 2622. No building or other structure shall be moved from one location to another location until and after the methods or means to be used and the procedure to be followed in connection with the moving of any building or other structure shall have been approved by the Buildings Engineer.

Moving Over Public Property

Par. 2625. No permit shall be issued by the Buildings Engineer to move any building or other structure from one location to another location over any street, alley or other public way unless and until after the Highways Engineer of the Mayor and City Council of Baltimore has approved of the issuance of such permit and has determined the route to be followed, the time when, under what conditions and to what extent any particular street, alley or other public way may be used for any such moving operation; and no permit shall be issued by the Buildings Engineer to move any building or other structure over any other public property until and after the bureau, department, board, or other governmental agency having jurisdiction over any particular public property has granted permission to do so.

The Buildings Engineer shall notify the Police Commissioner for the City of Baltimore, and the Board of Fire Commissioners of Baltimore City concerning the route to be followed in moving any such building or other structure and the probable period of time which will be consumed for performing any particular operation.

Moving Over Private Property

Par. 2626. No permit shall be issued by the Buildings Engineer to move any building or other structure over any private property until and after the owner or owners of any particular private property has or have given his or their written permission to do so.

SECTION 265

FIRE PROTECTION WHEN MOVING OR RAZING BUILDINGS

Required Fire Extinguishers When Razing Buildings

Par. 2653. Whenever any building or other structure is being moved, razed or demolished one two-and-one-half gallon portable fire extinguisher shall be provided and maintained ready for use on every such building or other structure. All such fire extinguishers shall be located in or on the building or other structure being moved, razed or demolished so as to be readily accessible.

Standpipes in Buildings Being Razed

Par. 2655. In all cases where any building or other structure 75 feet or more in height is being razed, and such building or other structure contains standpipes, such standpipes shall be kept and maintained in service, during the entire time that any such building or other structure is being razed, up to a point not less than three stories below the highest story of any such building or other structure which has not yet been removed. Provided, however, when any such building or other structure has been razed down to a point which is 50 feet or less from the ground, all standpipes in any such building or other structure may be removed.

CHAPTER 27

PARTY WALLS

Sec. 270—General Regulations for Party Walls.
Sec. 272—Construction of Party Walls.
Sec. 273—Underpinning Party Walls.
Sec. 274—Additions to Party Walls.
Sec. 275—Alterations to Party Walls.
Sec. 276—Repairs to Party Walls.
Sec. 277—Protection of Party Walls.
Sec. 279—Other Party Line Construction.

SECTION 270

GENERAL REGULATIONS FOR PARTY WALLS

Scope of Regulations for Party Walls

Par. 2700. Any and all of the provisions of Section 270 of this Code shall apply to any and all operations which may be performed in connection with the construction, erection, alteration, repair, maintenance, moving, razing or demolition of any and all walls, fences, downspouts, steps, porches or any other parts or portions of any building or other structure in which said walls, fences, downspouts, steps, porches or other parts or portions of any building or other structure are located either wholly on one property or on two or more properties and said walls, fences, downspouts, steps, porches or other parts or portions of any building or other structure are used or adapted for joint service between two or more properties.

Notice to Owners of Adjoining Property

Par. 2701. Before the Buildings Engineer shall issue a permit for the doing of any work or the performance of any operation which involves any existing or proposed party wall or any other part or portion of any building or other structure and is used or proposed to be used for joint service between two or more properties, any and all notices shall be given as required by the provisions of Chapter 14 of this Code.

Survey Plats and Information to be Furnished

Par. 2702. In all cases where application is made for a permit to do any work or perform any operation which involves any existing or proposed party wall or any other part or portion of any building or other structure which is used or proposed to be used for joint service between two or more properties, the Buildings Engineer, before issuing any such requested permit, may require that he be furnished with a survey plat which shall plainly and definitely locate said party wall or any other said part or portion of a building or other structure in reference to any and all lot lines of any and all properties involved in any particular case, and the Buildings Engineer, before issuing any such requested permit, may also require that he be furnished with the original or certified copies of any and all legal instruments, papers, information and data which may in any way have any bearing on or relate to any rights or interests which any person, firm or corporation has or may have in and to any property or properties on which any such work or operations is to be done or performed.

Issuance of Permits Involving Party Walls

Par. 2703. No permit shall be issued to any person, firm or corporation to do any work or perform any operation on, in, upon, over, under or against any existing or proposed party wall or any other part or portion of a building or other structure which is used or proposed to be used for joint service between two or more properties, unless the person, firm or corporation making application for such a permit attaches to the said application an affidavit to the effect that he or it has or possesses such a sufficient legal title, right or interest in and to the particular property which may be affected in any manner by any such proposed work or operation as entitles him, them or it to do or perform such work or operation on, in, upon, over, under or against the property where such work or operation is to be done or performed.

Loading of Party Walls

Par. 2704. In the absence of an agreement between the owners of a party wall or any other part or portion of a building or other structure which is used for joint service between two or more properties, no permit shall be issued by the Buildings Engineer to any person, firm or corporation to load one side of any party wall or any other part or portion of a building or other structure which is used for joint service between two or more properties to more than one-half the capacity of any such party wall or other part or portion of a building or other structure which is used for joint service between two or more properties.

Maintenance and Repair of Projections from Party Walls

Par. 2705. In the absence of an agreement between the owners of a party wall or any other part or portion of a building or other structure used for joint service between two or more properties, all chimneys and other projections from any party wall or any other part or portion of a building or other structure used for joint service between two or more properties shall be maintained and kept in repair by the owner of the property on which any such chimney or other projection is located.

SECTION 272

CONSTRUCTION OF PARTY WALLS

General Requirements for Construction of Party Walls

Par. 2720. All party walls shall be deemed to be exterior walls and shall comply with all of the requirements of this Code for the thickness of exterior walls and also with all of the provisions for fire walls in Section 598 in so far as any and all of the provisions of said Section 598 are applicable.

Openings in Party Walls

Par. 2721. No permit shall be issued by the Buildings Engineer to construct any opening in any party wall, except that the Buildings Engineer may issue a permit to construct doorway openings in a particular party wall for inter-communication between the building or other structure located on both sides of any particular party wall when the owners of the buildings or other structures located on both sides of any particular party wall request, in writing, the Buildings Engineer to issue a permit to construct such doorway openings. Provided, that in all cases where doorway openings are permitted to be constructed in any particular party wall, such doorway openings shall fully conform in all respects to all of the provisions of Paragraph 5982 of this Code.

SECTION 273

UNDERPINNING PARTY WALLS

General Repuirements for Underpinning Party Walls

Par. 2730. In all cases where any party wall is underpinned, such underpinning shall be done in accordance with the requirements and provisions of Chapter 23 of this Code.

Permits for Underpinning Party Walls

Par. 2731. Before any underpinning operations, which involve any party wall, are commenced, an Alteration Application shall be filed with, and a permit to perform such underpinning operations shall be secured from the Buildings Engineer in accordance with the provisions of Section 133 and Section 143 of this Code.

SECTION 274

ADDITIONS TO PARTY WALLS

General Requirements for Additions to Party Walls

Par. 2470. Before any party wall is extended in height or length or in any other way added to, the person or persons contemplating any such operations shall notify the owner of the property adjoining the site of any such operations as provided by the provisions of Paragraph 1431 of this Code.

The construction of any and all party walls, and any additions thereto, shall comply with all of the requirements of this Code.

Cost of Additions to Party Walls

Par. 2741. In the absence of an agreement, the entire cost of constructing any addition to a party wall whether it is for the purpose of increasing the length or height of any such party wall, shall be paid by the person, firm or corporation causing any such addition or extension to be made.

Party Walls Increased in Height

Par. 2742. No permit shall be issued by the Buildings Engineer to add to the height or length of a party wall until and after the owners of the properties located on both sides of any particular party wall shall have filed with the Buildings Engineer their written consent to such addition or extension in any particular case.

SECTION 275

ALTERATIONS TO PARTY WALLS

Closing Openings in Party Walls

Par. 2751. The owner of the property on either side of a party wall may close any opening in any particular party wall with the consent of the owner of the property located on the other side of any particular party wall.

SECTION 276

REPAIRS TO PARTY WALLS

General Requirements for Repairing Party Walls

Par. 2760. All party walls shall be kept safe and secure by the owners of such walls.

Unsafe and Dangerous Party Walls

Par. 2761. Whenever any party wall is unsafe or dangerous or is about to become unsafe or dangerous to persons or property, upon the receipt of information to that effect, the Buildings Engineer shall serve a violation or condemnation notice or order in accordance with the provisions of Section 183 of this Code, on the owner or owners of such party wall.

When Owners Refuse to Repair Party Walls

Par. 2762. Whenever the owner or owners of any party wall fails or neglects to comply with any condemnation notice or order issued by the Buildings Engineer in accordance with the provisions of Paragraph 2761 of this Code, then the Buildings Engineer shall condemn such party wall and any and all parts or portions of any building or other structure which may be affected by such unsafe or dangerous party wall and proceed in accordance with the provisions of Section 185 of this Code.

SECTION 277

PROTECTION OF PARTY WALLS

Protection of Party Walls During Demolition

Par. 2771. Any party wall exposed by the demolition of any building or other structure shall be protected as required in Paragraph 2603 of this Code.

Treatment of Party Walls

Par. 2772. Whenever any building or other structure is altered, changed, razed or demolished so as to expose any party wall which forms a part of the building or other structure being altered, changed, razed or demolished, the owner of the building or other structure upon which any of the aforesaid operations are being performed shall repair and restore all flashing on any adjoining property which has been broken or damaged during any such operations, and shall remove any and all plaster from the exposed side of any such party wall if it complies with the requirements of this Code pertaining to walls of new buildings, and shall stucco or point up and finish the entire exposed side of any such party wall, if it complies with the requirements of this Code pertaining to walls of new buildings, in the same manner as is required by this Code for new construction.

Unsafe Party Walls

Par. 2773. In all cases where any building or other structure which is enclosed on one or more sides with a party wall or party walls is wholly or partly removed, razed or demolished and, after any such operation has been performed, any such party wall or party walls which are left standing and exposed meet the requirements of this Code relative to exterior walls for new buildings but which for any reason are dangerous or unsafe, such dangerous or unsafe party wall or party walls shall be made safe and secure by the owner of the building or other structure which has been wholly or partly removed, razed or demolished.

Non-Conforming Party Walls

Par. 2774. In the event that any building or other structure which is encolsed on one or more sides with a party wall or party walls is wholly or party removed, razed or demolished and, after any such operation has been performed, any such party wall or party walls which are left standing and exposed and which do not meet the requirements of this Code relative to exterior walls for new buildings, shall be deemed to be dangerous and unsafe for use as exterior walls, any such party wall or party walls shall be removed by the owner of the building or other structure left standing and served by any such party wall or party walls.

After any such party wall or party walls have been removed as aforesaid, the owners of any properties which have been affected by the removal of any such party wall or party walls may construct and erect new exterior walls on their own property or the said owners may erect a new party wall or party walls in place of the party wall or party walls which have been removed, provided, any and all new walls which may be constructed and erected comply with the provisions of this Code pertaining to party walls or exterior walls for new buildings, as the case may be.

Liability for Unsafe and Non-Conforming Party Walls

Par. 2775. Nothing contained in Paragraph 2773 and Paragraph 2774 of this Code shall be taken or construed to determine or fix the liability as between the several owners of any particular party wall or party walls for the payment of any and all costs and expenses incurred in connection with the doing of any work or the performance of any operation required to be done or made by the provisions of said Paragraph 2773 and Paragraph 2774 of this Code.

SECTION 279

OTHER PARTY LINE CONSTRUCTION

Continuous Porches Across Party Lines

Par. 2791. Any and all parts or portions of any porch which continues over any adjoining property which is used for joint service between two or more properties shall be maintained and kept in good repair by the owners of such part or portion of any such porch which is used for joint service.

In the event that any porch which is one of a continuous line of porches is removed, razed or demolished, the owner of any such porch shall finish the ends of any porch or porches adjoining that which has been removed with the same architectural treatment and construction as that of such remaining porch or porches.

No permit shall be issued by the Buildings Engineer to inclose any porch attached to the front of any building or other structure which is one of a continuous line of two or more front porches until and after the written consent of the owners of the front porches immediately adjacent to the front porch which is proposed to be inclosed has been filed with the Buildings Engineer.

Provided, however, that where any porch of a continuous line of two or more front porches has already been enclosed and such enclosed front porch is immediately adjacent to any front porch which is proposed to be enclosed, then, in that event, it shall not be necessary to file with the Buildings Engineer the written consent of the owner of the front porch already enclosed.

The enclosure of such porches shall not be considered as exterior walls and need not conform to any required construction.

Joint Steps to Two or More Properties

Par. 2792. Any and all steps which are used for joint service between two or more properties shall be maintained and kept in repair by the owners of all the properties served by such steps, and no such steps shall be removed, changed or altered without the written consent of the owners of the properties served by any such steps.

Party Fences

Par. 2793. Any and all party fences shall be constructed and maintained in accordance with the provisions of Paragraph 4993 of this Code.

Party Downspouts and Gutters

Par. 2794. Whenever any existing downspout or gutter which is used for joint service between two or more properties is not properly maintained and kept in repair, the Buildings Engineer shall order the owners of the properties served by any such downspout or gutter to construct and maintain independent downspouts and gutters on their own properties.

Party Cornices, Roofing and Flashing

Par. 2795. Whenever any cornice, flashing or roofing which is used for joint service between two or more properties becomes defective in any respect, such cornice, flashing or roofing shall be repaired by the owner of the property on which any such defective cornice, flashing or roofing is located, and such repairs shall be made in such a manner so as to continue such cornice flashing or roofing for joint service as originally designed and constructed.

CHAPTER 29

OTHER MISCELLANEOUS REGULATIONS

Sec. 290—General Requirements for Other Miscellaneous Regulations.
Sec. 291—Changes Due to Public Improvements.
Sec. 292—Quarry Holes.
Sec. 294—Ratproofing.
Sec. 295—Termite Proofing.
Sec. 296—Trees and Shrubbery.
Sec. 298—House Numbers.

SECTION 290

GENERAL REQUIREMENTS FOR OTHER MISCELLANEOUS REGULATIONS

Scope of Other Miscellaneous Regulations

Par. 2900. Other miscellaneous regulations include any and all regulations of a special or miscellaneous nature not provided for elsewhere in this Code.

SECTION 291

CHANGES DUE TO PUBLIC IMPROVEMENTS

Raising or Moving Builings Because of Public Improvements

Par. 2910. An existing building or other structure not conforming to the provisions of this Code may be moved vertically or horizontally, or both, from one location to another location on the same lot or parcel of land on which it is situated by the owner of such building or other structure when it is necessary to do so because of a change of grade in a street, alley or public way, without making any such building or structure conform to the requirements of this Code. Provided, however, that any and all work done or operations performed in connection with the moving of, or the making of any alterations to, any such building or other structure shall be done or performed in strict accordance with the provisions of this Code.

SECTION 292

QUARRY HOLES

Scope of and General Requirements for Quarry Holes

Par. 2920. Quarry holes shall include any and all quarries which have been abandoned or which are not being actively operated as well as any and all other similar excavated holes or depressions in the earth and the provisions of Section 292 of this Code shall apply to any and all of such quarries or similar excavated holes or depressions in the earth.

Protection of Quarry Holes

Par. 2921. All quarry holes shall be completely enclosed with fences which shall be not less than 6 feet in height and which shall have no openings therein through which a 3-inch ball will pass. All such fences shall be provided with one or more gates and all such gates shall be kept closed and securely locked except at such times when any duly authorized person is upon the premises.

Provided, however, that the Buildings Engineer, in his discretion, may permit the use of any walls of a building or other structure, retaining walls or other barriers to serve as a part or all of the required enclosure around any quarry hole if such walls or barriers adequately protect any such quarry hole to the same extent as any required fence.

Maintenance of Quarry Hole Protection

Par. 2923. The owner of every quarry hole shall maintain and keep in repair all required fences and other barriers protecting any quarry hole so that such fences and other barriers shall be in a safe and secure condition at all times.

Penalty for Non-Protected Quarry Holes

Par. 2925. In the event that the owner of any quarry hole fails to comply with the provisions of Section 292 of this Code, he shall be guilty of a safety violation and shall be subject to the penalties prescribed in Paragraph 1922 of this Code.

Protection of Quarry Holes by Buildings Engineer

Par. 2926. In the event that the owner of any quarry hole fails to fully comply with any or all of the provisions of Section 292 of this Code, after having been notified by the Buildings Engineer to do so, the Buildings Engineer shall, and he is hereby authorized and empowered to, enter upon the property where any such quarry hole is located and do or cause to be done any work or perform or cause to be performed any operations which may be necessary to sufficiently and adequately protect any such quarry hole in accordance with the provisions of Section 292 of this Code, at the sole cost and expense of the owner of the property on which any such quarry hole is located.

The entire amount of money expended by the Buildings Engineer in connection with sufficiently and adequately protecting any such quarry hole shall be a debt due by the owner of the property on which any such quarry hole is located to the Mayor and City Council of Baltimore, and shall also be a lien on the property on which any such quarry hole is located, and such debt and lien shall be collected as provided in Section 193 of this Code.

SECTION 294

RATPROOFING

General Requirements for Ratproofing

Par. 2940. Any and all buildings or other structures, and any and all portions thereof, hereafter erected, constructed, reconstructed or altered, shall be made ratproof, and in connection therewith the provisions of Section 294 of this Code and all other applicable provisions of this Code shall be complied with.

Ground Floors of all Buildings for Ratproofing

Par. 2942. All ground floors of all buildings shall be completely covered with a concrete slab not less than 3 inches thick or other similar ratproof material.

Protection of Openings for Ratproofing

Par. 2943. All cellar windows and other similar openings less than two feet from ground shall be protected with a screen of rat proof material. Provided, however, that in Dwellings two stories or less in height and not over 2,000 square feet in area, ordinary fly screens may be used in lieu of screens of rat proof material.

Ratproofing of Holes in Floors, Walls and Partitions

Par. 2944. All holes in floors, walls or partitions of buildings or other structures through which rats may have access shall be completely closed with ratproof material or otherwise protected so that it will be impossible for rats to get through.

Ratproofing Construction

Par. 2945. Plain and reinforced concrete, all brick, tile, concrete blocks or cut stone masonry laid with joints not exceeding ⅝ inch in thickness; all smooth sheet metal work; tin with seams bent downward; cement or gypsum plaster on metal lathe; wire glass in metal frames; all metal clad doors and windows; No. 10 gauge wire grills with one-half inch mesh or less and other similar construction through which rats cannot gnaw or force their way, or on which they cannot get a foothold; shall be considered ratproof construction.

Ratproofing of Accessory Buildings

Par. 2948. Accessory buildings and other similar buildings or structures shall be erected or constructed as required in Sections of Chapter 49 of this Code.

Violation of Ratproofing Regulations

Par. 2949. Violations of the requirements of this section constitute health violations and are subject to the penalties prescribed in Paragraph 1923 of this Code.

SECTION 295

TERMITE PROOFING

General Requirements for Termite Proofing

Par. 2951. Except for certain general provisions of this Code relative to the construction or erection of any building or other structure which in themselves prevent or tend to prevent damage by termites, no special provisions relative to termite proofing are provided for in this Code.

SECTION 296

TREES AND SHRUBBERY

General Requirements for Trees and Shrubbery

Par. 2960. No permit shall be required for the planting of trees or shrubbery on private property.

No trees or shrubbery shall be planted on any street or other public way without first obtaining special permission from the Highways Engineer and the City Forester of the Mayor and City Council of Baltimore to do so, and no trees or shrubbery shall be planted on any other public property without first obtaining special permission from the department, bureau or other public agency having jurisdiction over any such public property to do so.

Protection of Trees and Shrubbery

Par. 2962. All trees and shrubbery shall be protected against injury during the performance of any building operations and no trees or shrubbery shall be removed without the consent of the owner thereof.

Removal of Trees and Shrubbery

Par. 2963. Any and all trees or shrubbery which are dangerous to life or property or which create a fire hazard shall be removed by the owners thereof.

Pruning of Trees and Shrubbery

Par. 2965. Any and all trees and shrubbery shall be removed or kept properly pruned by the owner thereof, if any such trees or shrubbery obstruct, project over or encroach upon any property other than that upon which any such trees or shrubbery are planted.

SECTION 298

HOUSE NUMBERS

General Requirements for Numbering of Buildings

Par. 2980. The number of every new building shall be determined and fixed by the Bureau of Plans and Surveys, and each such number shall be reported to the owner or occupant of such building by said Bureau.

Whenever an existing building does not have a number which has been fixed and determined by the Bureau of Plans and Surveys, the said Bureau shall determine and fix a number for such building, and such number shall be reported to the owner or occupant of such building by said Bureau.

In order to correct mistakes and avoid confusion, the Bureau of Plans and Surveys is hereby authorized and empowered to change an existing number of any building, and upon changing any such existing number the said Bureau shall report such change of number to the owner or occupant of the building on which the number has been changed.

Time for Placing and Changing Numbers on Buildings

Par. 2981. Immediately after any new building has been substantially completed the owner or occupant of any such building shall place the number assigned to such new building on the entrance to the premises on which any such building is located.

In all cases where the number of any building is changed, the owner or occupant of any such building shall place the new number on the front entrance to the premises on which any such building is located within 10 days after receiving a notice from the Bureau of Plans and Surveys relative to the changing of the number of any such building.

In the event that any existing building does not have a number which has been fixed and determined by the Bureau of Plans and Surveys, the owner or occupant of any such building shall place the number fixed and determined for any such building by the Bureau of Plans and Surveys on the front entrance to the premises on which any such building is located within 10 days after receiving a notice from the Bureau of Plans and Surveys relative to the determination of a number for such building.

Whenever the number of any building is changed, the owner or occupant of any such building shall completely remove or obliterate the old number of any such building within 10 days after receiving a notice from the Bureau of Plans and Surveys relative to the changing of the number of any such building.

Visibility and Size of Numbers on Buildings

Par. 2982. The number of every building shall be in Arabic numerals and plainly visible and legible in day time from a point 4 feet above the curb line located immediately in front of the front entrance to the premises on which any such building is located.

Established Numbers on Buildings

Par. 2983. No person, firm or corporation shall place any number on any particular building except the number which has been determined and established by the Bureau of Plans and Surveys for said building.

No person, firm or corporation shall eliminate, change or alter the number on any building except in compliance with a notice from the Bureau of Plans and Surveys relative to changing or altering the number of any particular building.

Enforcement of Section 298 of This Code

Par. 2984. The Bureau of Plans and Surveys shall enforce the provisions of Section 298 of this Code.

Penalty for Violation of Section 298 of This Code

Par. 2985. Every person, firm or corporation who fails or refuses to comply with any and all of the provisions of Section 298 of this Code shall be guilty of a Miscellaneous Violation and shall be subject to the penalties prescribed in Paragraph 1929 of this Code.

PART III

FIRE ZONE REGULATIONS

Chap. 30—General Fire Zone Regulations.

Chap. 31—First Fire Zone.

Chap. 32—Second Fire Zone.

Chap. 33—Third Fire Zone.

Chap. 34—Fourth Fire Zone.

CHAPTER 30

GENERAL FIRE ZONE REGULATIONS

Sec. 300—General Fire Zone Requirements.

Sec. 301—Classification of Fire Zones.

Sec. 302—Fire Zone Boundaries.

SECTION 300

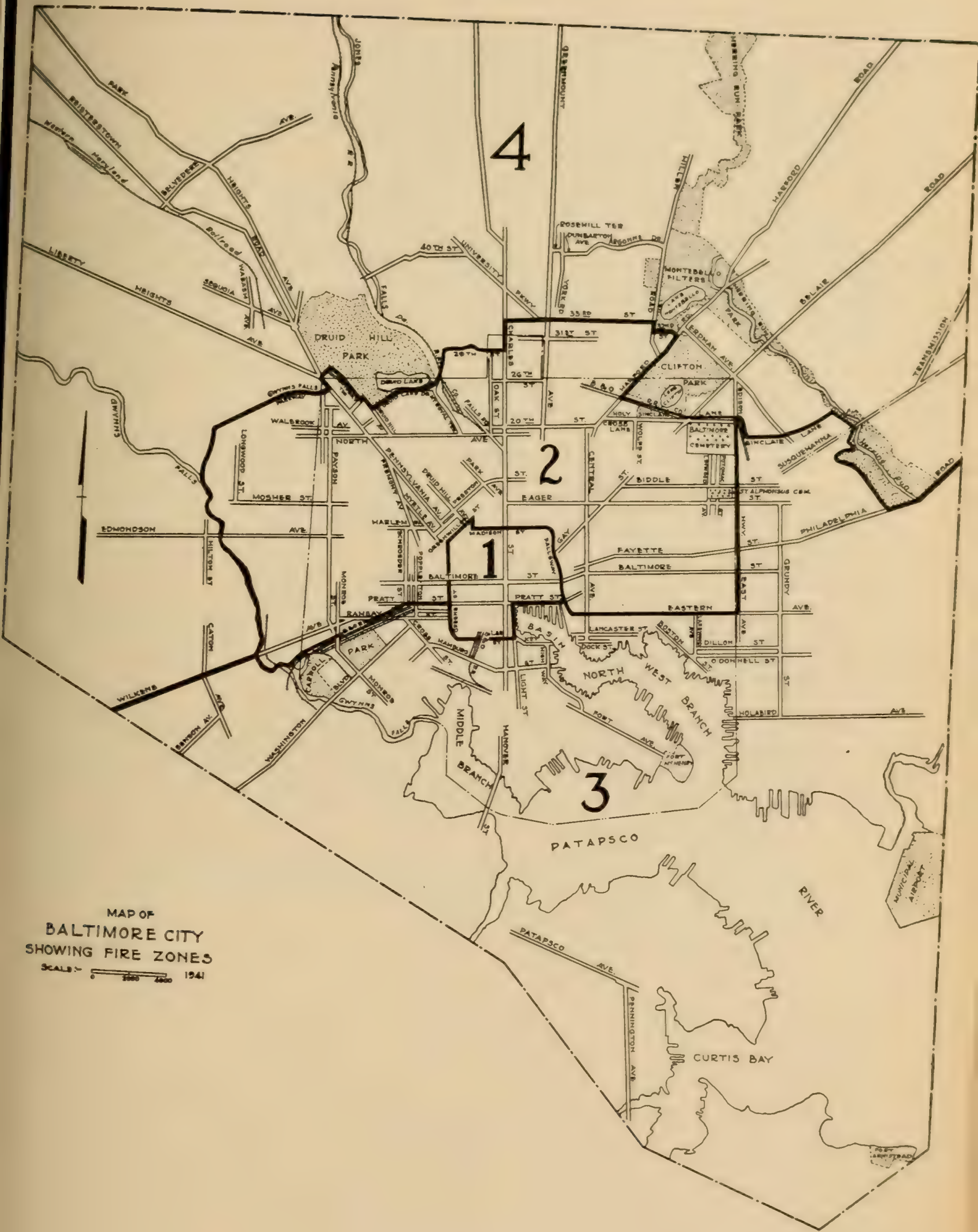
GENERAL FIRE ZONE REQUIREMENTS

Scope of Fire Zone Regulations

Par. 3000. Fire zone regulations include the exceptions and restrictions to the basic requirements of other parts of this Code which regulate the location, occupancy, height and volume of buildings or other structures in the various fire zones hereinafter provided in this Code.

Grouping Buildings in Fire Zones

Par. 3001. The distances required by the provisions of Part III of this Code between certain types of buildings may be reduced if the group of buildings with such closer spacing is considered as one building and is made to conform to all of the applicable provisions of this Code.



MAP OF
BALTIMORE CITY
SHOWING FIRE ZONES
SCALE:- 0 2000 4000 1941

SECTION 301

CLASSIFICATION OF FIRE ZONES

Classification of Fire Zones

Par. 3011. The City of Baltimore is hereby divided into four Fire Zones, to be designated as the First, Second, Third and Fourth Fire Zone.

SECTION 302

FIRE ZONE BOUNDARIES

Determination of Boundaries

Par. 3021. The precise location of fire zone boundary lines shall be determined as follows:

1. Where a fire zone boundary line is within, or binding along, a street, alley, stream or river, such boundary line shall be deemed to be in the center of such street, alley, stream or river except in cases where the side of such a stream or river is designated as the boundary line.

2. Where a fire zone boundary line binds along a railroad, the right of way line as designated shall be the boundary line of such fire zone.

CHAPTER 31

FIRST FIRE ZONE

Sec. 310—General Requirements for First Fire Zone.

Sec. 313—Type C Building Restrictions in First Fire Zone.

Sec. 314—Type D Building Restrictions in First Fire Zone.

Sec. 315—Type E Building Restrictions in First Fire Zone.

Sec. 316—Type F Building Restrictions in First Fire Zone.

Sec. 317—Type G Building Restrictions in First Fire Zone.

Sec. 318—Type M Building Restrictions in First Fire Zone.

Sec. 319—Private Use of Streets in First Fire Zone.

SECTION 310

GENERAL REQUIREMENTS FOR FIRST FIRE ZONE

Boundary of First Fire Zone

Par. 3101. The First Fire Zone shall be in the downtown congested district and shall include all the area within the following boundary lines:

Beginning at the intersection of Light and Pratt Streets, thence southerly along Light Street to Lee Street, thence westerly along Lee Street to Greene Street, thence northwesterly along Greene Street to Washington Boulevard, thence northeasterly along Washington Boulevard to Greene Street, thence northerly along Greene Street to Pennsylvania Avenue, thence northwesterly along Pennsylvania Avenue to St. Mary Street, thence north-easterly along St. Mary Street to Eutaw Street, thence southerly along Eutaw Street to Madison Street, thence easterly along Madison Street to Fallsway, thence in a general southerly and south-easterly direction along Fallsway to Baltimore Street, thence westerly along Baltimore Street to West Falls Avenue, thence southerly along West Falls Avenue to Pratt Street, thence westerly along Pratt Street to its intersection with Light Street, the point of beginning.

SECTION 313

TYPE C BUILDING RESTRICTIONS IN FIRST FIRE ZONE

New Type C Buildings In First Fire Zone

Par. 3131. No new Type C, Steel Frame, building or fire division thereof in the First Fire Zone shall exceed 500,000 cubic feet in volume. Hazardous occupancies shall not be permitted in such buildings or fire division thereof.

Existing Type C Buildings In First Fire Zone

Par. 3132. The volume of no existing Type C, Steel Frame, building or fire division thereof in the First Fire Zone shall be increased beyond the limits fixed for new buildings in Paragraph 3131 of this Code, nor shall the occupancy of any such building or fire division thereof be changed to a hazardous occupancy.

SECTION 314

TYPE D BUILDING RESTRICTIONS IN FIRST FIRE ZONE

New Type D Buildings In First Fire Zone

Par. 3141. No new Type D, Slow Burning, building or fire division thereof in the First Fire Zone shall exceed 250,000 cubic feet in volume. Hazardous occupancies shall not be permitted in such buildings or fire division thereof.

Existing Type D Buildings In First Fire Zone

Par. 3142. The volume of no existing Type D, Slow Burning, building or fire division thereof in the First Fire Zone shall be increased beyond the limits fixed for new buildings in Paragraph 3141 of this Code, nor shall the occupancy of any such building or fire division thereof be changed to a hazardous occupancy.

SECTION 315

TYPE E BUILDING IN RESTRICTIONS FIRST FIRE ZONE

New Type E Buildings In First Fire Zone

Par. 3151. No new Type E, Ordinary, building or fire division thereof in the First Fire Zone shall exceed 50,000 cubic feet in volume. Hazardous occupancies shall not be permitted in such buildings or fire division thereof.

Every such building or fire division thereof, in the First Fire Zone, more than 10,000 cubic feet in volume or over one story or 20 feet in height, shall be equipped with an automatic sprinkler system of a class required in Part IV of this Code for the respective occupancies.

Existing Type E Buildings In First Fire Zone

Par. 3152. The volume of no existing Type E, Ordinary, building or fire division thereof in the First Fire Zone shall be increased beyond the limits fixed for new buildings in Paragraph 3151 of this Code, nor shall a light hazardous occupancy of any such building or fire division thereof be changed to a moderately hazardous occupancy, if the volume of any such building or fire division thereof exceeds 100,000 cubic feet, nor shall the occupancy of any such building or fire division thereof be changed to a hazardous occupancy.

SECTION 316

TYPE F BUILDING RESTRICTIONS IN FIRST FIRE ZONE

New Type F Buildings In First Fire Zone

Par. 3161. No new Type F, Metal, building or fire division thereof in the First Fire Zone shall exceed 5,000 cubic feet in volume, except that when the exterior walls thereof are lined on the inside to provide two-hour fire-resistance and the height thereof is not more than one story or 15 feet, it shall not be in excess of 30,000 cubic feet in volume. Such a building, either lined or unlined, or fire division thereof may be constructed not closer than 2 feet 6 inches to any adjoining property line, and shall not be constructed closer than 5 feet to any Type G, Wood Frame, or any other Type F building or any opening in another building.

Existing Type F Buildings In First Fire Zone

Par. 3162. No existing Type F, Metal, building or fire division thereof in the First Fire Zone shall be increased in height or volume beyond the limits fixed for new buildings in Paragraph 3161 of this Code.

SECTION 317

TYPE G BUILDING RESTRICTIONS IN FIRST FIRE ZONE

New Type G Buildings In The First Fire Zone

Par. 3171. No new type G, Wood Frame, building or fire division thereof in the First Fire Zone shall exceed 1,000 cubic feet in volume. Such a building or fire division thereof may be constructed not closer than 2 feet 6 inches to any adjoining property line, and shall not be constructed closer than 5 feet to any Type F, Metal, or any other Type G, Wood Frame, building, or any opening in another building.

Existing Type G Buildings In First Fire Zone

Par. 3172. The volume of no existing Type G, Wood Frame, building or fire division thereof in the First Fire Zone shall be increased beyond the limits fixed for new buildings in Paragraph 3171 of this Code, nor shall the occupancy of any such building or fire division thereof be changed to a more hazardous occupancy.

SECTION 318

TYPE M BUILDING RESTRICTIONS IN FIRST FIRE ZONE

Type M Buildings In First Fire Zone

Par. 3181. The restrictions for new and existing Type M buildings or fire divisions thereof in the First Fire Zone shall be the same as those set forth in this Chapter for the equivalent types of building.

SECTION 319

PRIVATE USE OF STREETS IN FIRST FIRE ZONE

Steps In First Fire Zone

Par. 3191. Steps shall not project into any street, alley or other public way in the First Fire Zone.

CHAPTER 32

SECOND FIRE ZONE

Sec. 320—General Requirements for Second Fire Zone.
Sec. 326—Type F Building Restrictions in Second Fire Zone.
Sec. 327—Type G Building Restrictions in Second Fire Zone.
Sec. 328—Type M Building Restrictions in Second Fire Zone.

SECTION 320

GENERAL REQUIREMENTS FOR SECOND FIRE ZONE

Boundary Of Second Fire Zone

Par. 3201. The Second Fire Zone shall be in the more thickly populated residential and commercial districts and shall include all the area within the following boundary lines:

Beginning at the intersection of Greene Street and Pratt Street, thence westerly along Pratt Street to Carey Street, thence southerly along Carey Street to the extension of the northern right-of-way line of the Baltitmore and Ohio Railroad, thence southwesterly along the said right-of-way line to Gwynns Falls, thence in a general northerly and northwesterly direction along Gwynns Falls to the western right-of-way line of the Western Maryland Railroad, thence northerly along said right-of-way line to Franklintown Road, thence northwesterly along Franklintown Road to the eastern boundary line of Gwynns Falls Park, thence following northeasterly and then in a general northerly direction along the eastern boundary line of Gwynns Falls Park to Winterbourne Road, thence northeasterly along Winterbourne Road to Hilton Street, thence northerly along Hilton Street to Gwynns Falls Parkway, thence easterly along Gwynns Falls Parkway to Reisterstown Road, thence northwesterly along Reisterstown Road to Auchentoroly Terrace, thence northeasterly and then southeasterly along Auchentoroly Terrace to Fulton Avenue, thence northeasterly along Fulton Avenue to Druid Hill Avenue, thence southeasterly along Druid Hill Avenue to Cloverdale Road, thence northeasterly along Cloverdale Road to

Druid Hill Lake Drive, thence easterly along Druid Hill Lake Drive to Twenty-ninth Street extended, thence northeasterly along Twenty-ninth Street extended to the eastern boundary line of Wyman Park, thence in a general northerly direction along the eastern boundary line of Wyman Park to Remington Avenue, thence northwesterly a short distance along Remington Avenue to Wyman Park Drive, thence northeasterly and then southeasterly along Wyman Park Drive to Twenty-ninth Street, thence easterly along Twenty-ninth Street to Charles Street, thence northerly along Charles Street to Thirty-third Street, thence easterly along Thirty-third Street to Hillen Road, thence southerly along Hillen Road to Thirty-second Street, thence easterly along Thirty-second Street to Harford Road, thence southwesterly along Harford Road to the northern right-of-way line of the Baltimore and Ohio Railroad, thence southeasterly and easterly along said right-of-way line to Edison Highway, thence southerly along Edison Highway to Monument Street, thence southerly along Loney's Lane and the extension of Loney's Lane to Fayette Street, thence southerly along East Avenue to Eastern Avenue, thence westerly along Eastern Avenue to President Street, thence northwesterly along President Street to Pratt Street, thence westerly along Pratt Street to West Falls Avenue, thence northerly, westerly and southerly along the eastern, northern and western boundary lines, respectively, of the First Fire Zone, to the intersection of Greene Street and Pratt Street, the point of beginning.

SECTION 326

TYPE F BUILDING RESTRICTIONS IN SECOND FIRE ZONE

New Type F Buildings In Second Fire Zone

Par. 3261. No new Type F, Metal, building or fire division thereof in the Second Fire Zone shall exceed 5,000 cubic feet in volume, except that when the exterior walls thereof are lined on the inside to provide two-hour fire-resistance, and the height thereof is not more than two stories or 30 feet, it shall not be in excess of 150,000 cubic feet in volume. Such a building, either lined or unlined, or fire division thereof may be constructed not closer than 2 feet 6 inches to any adjoining property line, and shall not be constructed closer than 5 feet to any Type G, Wood Frame, building or any opening in another building. Where such metal buildings do not exceed 2500 cubic feet in volume the minimum distance from any adjoining property line may be reduced to one foot six inches.

Hazardous occupancies may be permitted in any such building or fire division thereof if its volume does not exceed 30,000 cubic feet and its distance from any adjoining property line is more than 25 feet, except that when the volume of any such building or fire division thereof does not exceed 5,000 cubic feet the distance from any such building or fire division thereof to any adjoining property line may be reduced to 2 feet 6 inches.

Existing Type F Buildings In Second Fire Zone

Par. 3262. No existing Type F, Metal, building or fire division thereof in the Second Fire Zone shall be increased in height or volume beyond the limits fixed for new buildings in Paragraph 3261 of this Code. The occupancy of any such building or fire division thereof may be changed to a hazardous occupancy if its volume does not exceed 30,000 cubic feet and if its distance from any property line is more than 25 feet, except that when the volume of any such building or fire division thereof does not exceed 5,000 cubic feet the distance from any such building or fire division thereof to any adjoining property line may be reduced to 2 feet 6 inches.

SECTION 327

TYPE G BUILDING RESTRICTIONS IN SECOND FIRE ZONE

New Type G Buildings In Second Fire Zone

Par. 3271. No new Type G, Wood Frame, building or fire division thereof in the Second Fire Zone shall exceed 2,000 cubic feet in volume. Such a building or fire division thereof which does not exceed 1,000 cubic feet in volume may be constructed not closer than 2 feet 6 inches to any adjoining property line, and such building or fire division thereof which exceeds 1,000 cubic feet in volume may be constructed not closer than 5 feet to any adjoining property line.

In addition to aforegoing, no such building or fire division thereof shall be constructed closer than 5 feet to any Type F, Metal, or any other Type G, Wood Frame, building or any opening in another building.

Existing Type G Buildings In Second Fire Zone

Par. 3272. The volume of no existing Type G, Wood Frame, building or fire division thereof in the Second Fire Zone shall be increased beyond the limits fixed for new buildings in Paragraph 3271 of this Code. No occupancy of any such building or fire division thereof shall be changed to a moderately hazardous occupancy if such building or fire division exceeds 2,000 cubic feet in volume. If any such existing building or fire division thereof has a hazardous occupancy, such occupancy may be changed to a moderately hazardous occupancy.

SECTION 328

TYPE M BUILDING RESTRICTIONS IN SECOND FIRE ZONE

Type M Buildings In Second Fire Zone

Par. 3281. The restrictions for new and existing Type M buildings or fire divisions thereof in the Second Fire Zone shall be the same as those set forth in this Chapter for the equivalent types of buildings.

CHAPTER 33

THIRD FIRE ZONE

Sec. 330—General Requirements for Third Fire Zone.
Sec. 336—Type F Building Restrictions in Third Fire Zone.
Sec. 337—Type G Building Restrictions in Third Fire Zone.
Sec. 338—Type M Building Restrictions in Third Fire Zone.

SECTION 330

GENERAL REQUIREMENTS FOR THIRD FIRE ZONE

Boundary of Third Fire Zone

Par. 3301. The Third Fire Zone shall be in the general industrial district in the southern section of the City, and shall include all the area within the following boundary lines:

Beginning at the intersection of the northern right-of-way line of the Baltimore and Ohio Railroad with Edison Highway, near Sinclair Lane, thence southeasterly along said right-of-way line to Sinclair Lane, thence easterly, and northeasterly along Sinclair Lane and the extension of Sinclair Lane to the western boundary line of Herring Run Park, thence in a general southeasterly direction along the western boundary line of Herring Run Park to Philadelphia Road, thence northeasterly along Philadelphia Road to the eastern City Boundary Line, thence southerly along the eastern City Boundary Line to the southeastern City Boundary Line, thence southwesterly along the southeastern City Boundary Line to the southwestern City Boundary Line thence northwesterly along the southwestern City Boundary Line to Wilkins Avenue, thence northeasterly along Wilkins Avenue to Gwynns Run, thence in a general easterly direction along the general southern boundary line of the Second Fire Zone to the western boundary line of the First Fire Zone, thence in a general easterly direction along the general southern boundary line of the First Fire Zone to the southern boundary line of the Second Fire Zone, thence easterly along the southern boundary line of the Second Fire Zone to the eastern boundary line of the Second Fire Zone, thence northerly along the eastern boundary line of the Second Fire Zone to its intersection with the northern right-of-way line of the Baltimore and Ohio Railroad, the point of beginning.

SECTION 336

TYPE F BUILDING RESTRICTIONS IN THIRD FIRE ZONE

New Type F Buildings In Third Fire Zone

Par. 3361. A new Type F, Metal, building or fire division thereof in the Third Fire Zone may be constructed not closer than 2 feet 6 inches to any adjoining property line if it does not exceed 100,000 cubic feet in volume and if it does not exceed two stories or 30 feet in height. No type F building or fire division thereof in the Third Fire Zone shall be constructed closer than 5 feet to any Type G, Wood Frame, building or any other Type F building. Where such buildings do not exceed 5000 cubic feet in volume and one story in height the minimum distance from any adjoining property line may be reduced to one foot six inches.

Hazardous occupancies may be permitted in any new Type F building or fire division thereof in the Third Fire Zone if it does not exceed 100,000 cubic feet in volume and one story in height and its distance from any adjoining property line is more than 25 feet.

Existing Type F Buildings In Third Fire Zone

Par. 3362. The occupancy of an existing Type F, Metal, building or fire division thereof in the Third Fire Zone may be changed to a hazardous occupancy if such a building or fire division thereof does not exceed 100,000 cubic feet in volume and one story in height and its distance from any adjoining property line is more than 25 feet. No occupancy of any such building or fire division thereof shall be changed to a moderately hazardous occupancy if the volume of any such building or fire division thereof exceeds 350,000 cubic feet. If any such existing building or fire division thereof has a hazardous occupancy, such occupancy may be changed to a moderately hazardous occupancy.

SECTION 337

TYPE G BUILDING RESTRICTIONS IN THIRD FIRE ZONE

New Type G Buildings In Third Fire Zone

Par. 3371. A new Type G, Wood Frame, building or fire division thereof in the Third Fire Zone may be constructed not closer than 2 feet 6 inches to any adjoining property line if it does not exceed 2,000 cubic feet in volume, and such a building or fire division thereof may be constructed not closer than 5 feet to any adjoining property line if it does not exceed 5,000 cubic feet in volume.

The distance between any new type G building or fire division thereof in the Third Fire Zone and any Type F building or any other Type G Building on the same property shall be at least 5 feet when the new Type G building or fire division thereof does not exceed 5,000 cubic feet in volume and at least 10 feet when the new Type G Building or fire division thereof exceeds 5000 cubic feet in volume.

A hazardous occupancy may be permitted in any new Type G Building or fire division thereof in the Third Fire Zone if it does not exceed 5,000 cubic feet in volume and one story in height, and is more than 10 feet from any adjoining property line.

Existing Type G Buildings In Third Fire Zone

Par. 3372. The occupancy of an existing Type G, Wood Frame, building or fire division thereof in the Third Fire Zone may be changed to a hazardous occupancy if such building or fire division thereof does not exceed 5,000 cubic feet in volume and one story in height, and is more than 10 feet from any adjoining property line.

SECTION 338

TYPE M BUILDING RESTRICTIONS IN THIRD FIRE ZONE

Type M Buildings In Third Fire Zone

Par. 3381. The restrictions for new and existing Type M buildings or fire divisions thereof in the Third Fire Zone shall be the same as those set forth in this Chapter for the equivalent types of buildings.

CHAPTER 34

FOURTH FIRE ZONE

Sec. 340—General Requirements for Fourth Fire Zone.
Sec. 346—Type F Building Restrictions in Fourth Fire Zone.
Sec. 347—Type G Building Restrictions in Fourth Fire Zone.
Sec. 348—Type M Building Restrictions in Fourth Fire Zone.

SECTION 340

GENERAL REQUIREMENTS FOR FOURTH FIRE ZONE

Boundary of Fourth Fire Zone

Par. 3401. The Fourth Fire Zone shall be in the general residential or suburban district in the northern section of the City and shall include all the area within the following boundary lines:

Beginning at the intersection of the eastern City Boundary Line and Philadelphia Road, thence in a general westerly direction along the general northern boundary line of the Third Fire Zone to the point of intersection of the eastern and northern boundary lines of the Second Fire Zone, thence in a general westerly and southerly direction along the general northern and western boundary lines of the Second Fire Zone to the northern boundary line of the Third Fire Zone, thence southwesterly along the northern boundary line of the Third Fire Zone to the southwestern City Boundary Line, thence northwesterly along the southwestern City Boundary Line to the western City Boundary Line, thence northerly along the western City Boundary Line to the northern City Boundary Line, thence easterly along the northern City Boundary Line to the eastern City Boundary Line, thence southerly along the eastern City Boundary Line to its intersection with Philadelphia Road, the place of beginning.

SECTION 346

TYPE F BUILDING RESTRICTIONS IN FOURTH FIRE ZONE

New Type F Buildings In Fourth Fire Zone

Par. 3461. A new Type F, Metal, building or fire division thereof in the Fourth Fire Zone may be constructed not closer than 2 feet 6 inches to any adjoining property line, if it does not exceed 5,000 cubic feet in volume and one story or 15 feet in height. Where such buildings do not exceed 2,500 cubic feet in volume and one story or ten feet in height, the minimum distance from any adjoining property line may be reduced to one foot six inches.

No Type F building or fire division thereof in the Fourth Fire Zone shall be constructed closer than 5 feet to any Type G, Wood Frame, building or any other Type F building.

A hazardous occupancy may be permitted in any new Type F building or fire division thereof in the Fourth Fire Zone if it does not exceed 75,000 cubic feet in volume and one story in height and is more than 50 feet from any adjoining property line.

Existing Type F Buildings In Fourth Fire Zone

Par. 3462. The occupancy of any existing Type F, Metal, building or fire division thereof in the Fourth Fire Zone may be changed to a hazardous occupancy if any such building or fire division does not exceed 75,000 cubic feet in volume and one story in height. No occupancy of any such building or fire division thereof shall be changed to a moderately hazardous occupancy, if the volume of any such building or fire division thereof exceeds 200,000 cubic feet. If any such building or fire division thereof has a hazardous occupancy, such occupancy may be changed to a moderately hazardous occupancy.

SECTION 347

TYPE G BUILDING RESTRICTIONS IN FOURTH FIRE ZONE

New Type G Buildings In Fourth Fire Zone

Par. 3471. A new Type G, Wood Frame, building or fire division thereof in the Fourth Fire Zone which does not exceed 5,000 cubic feet in volume may be constructed not closer than 5 feet to any adjoining property line.

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The distance between any new Type G building or fire division thereof, in the Fourth Fire Zone and any Type F building or any other type G building on the same property shall be at least 5 feet when the new Type G building or fire division thereof does not exceed 5,000 cubic feet in volume and at least 10 feet when the new Type G building or fire division thereof exceeds 5,000 cubic feet in volume.

Existing Type G Buildings In Fourth Fire Zone

Par. 3472. The occupancy of an existing Type G, Wood Frame, building or fire division thereof in the Fourth Fire Zone may be changed to a hazardous occupancy if such building or fire division thereof does not exceed 5,000 cubic feet in volume and one story in height and is more than 10 feet from any adjoining property line.

SECTION 348

TYPE M BUILDING RESTRICTIONS IN FOURTH FIRE ZONE

Type M Buildings In Fourth Fire Zone

Par. 3481. The restrictions for new and existing Type M buildings or fire divisions thereof in the Fourth Fire Zone shall be the same as those set forth in this Chapter for the equivalent types of buildings.

PART IV

ARCHITECTURAL REGULATIONS

Chap. 40—Occupancy Regulations.
Chap. 41—Public Assembly Buildings.
Chap. 42—Private Assembly Buildings.
Chap. 43—Dwellings.
Chap. 44—Institutions.
Chap. 45—Office Buildings.
Chap. 46—Commercial Buildings.
Chap. 47—Storage Buildings.
Chap. 48—Industrial Buildings.
Chap. 49—Special Structures.

CHAPTER 40

OCCUPANCY REGULATIONS

Sec. 400—General Occupancy Regulations.
Sec. 401—Classification and Definition of Occupancies.
Sec. 402—Multiple Occupancies.
Sec. 403—Mixed Occupancies.
Sec. 404—Existing Occupancies.
Sec. 405—Doubtful Occupancies.
Sec. 406—Change of Occupancy.
Sec. 407—Separation of Occupancies.

SECTION 400

GENERAL OCCUPANCY REGULATIONS

Applications, Permits and Certificates for Occupancies

Par. 4003. Applications shall be filed and permits secured for occupancy as required in Chapters 13 and 14. Building certificates shall be issued as required in Chapter 15.

Penalties for Violation of Occupancy Regulations

Par. 4009. The penalties for violating any of the occupancy regulations of this Code are set forth in Section 192.

SECTION 401

CLASSIFICATION AND DEFINITION OF OCCUPANCIES

Classification of Occupancies

Par. 4010. For the purpose of this Code, the occupancy of every building, or portion thereof, shall be classified as follows:

Class I—Public Assembly.
Class II—Private Assembly.
Class III—Dwelling Occupancy.
Class IV—Institutional Occupancy.
Class V—Office Occupancy.
Class VI—Commercial Occupancy.
Class VII—Storage Occupancy.
Class VIII—Industrial Occupancy.
Class IX—Occupancy of Special Structures.

Commercial, Storage and Industrial occupancies are further classified into hazardous, moderately hazardous and light hazardous occupancies, in Chapters 46, 47 and 48, respectively.

Public Assembly

Par. 4011. Public Assembly shall be construed to mean the assemblage of any number of persons for purposes of entertainment, amusement, convention, or other similar purposes.

Private Assembly

Par. 4012. Private Assembly shall be construed to mean the assemblage of any number of persons for religious or educational purposes, for parish or club meetings, or other assemblages of a similar nature.

Dwelling Occupancy

Par. 4013. Dwelling occupancy shall be construed to mean the use by human beings of an enclosure as an abode, habitation, residence or for other similar living or sleeping purposes.

Institutional Occupancy

Par. 4014. Institutional occupancy shall be construed to mean the use of an enclosure with sleeping or living accommodations as a place for medical care, asylum, reformation, detention or punishment, or other similar places where persons are so housed either voluntarily or against their will.

Office Occupancy

Par. 4015. Office occupancy shall be construed to mean the use of an enclosure as a place for the management or transaction of a business or profession, or other similar activities, not including the selling, storing or manufacturing of commodities.

Commercial Occupancy

Par. 4016. Commercial occupancy shall be construed to mean the use of an enclosure as a place for the sale or exchange of commodities, or for services or other similar commercial activities, but not including the rendering of professional services.

Storage Occupancy

Par. 4017. Storage occupancy shall be construed to mean the use of an enclosure for the storage or warehousing of commodities or other similar occupancies.

Industrial Occupancy

Par. 4018. Industrial occupancy shall be construed to mean the use of an enclosure for the manufacturing, assembling, or processing of commodities or other similar industrial activities.

Miscellaneous Uses

Par. 4019. Miscellaneous uses shall be construed to mean the use of a structure for such puposes which cannot be properly placed in any one of the foregoing classes of occupancy.

SECTION 402

MULTIPLE OCCUPANCIES

Scope of Multiple Occupancies

Par. 4020. Multiple occupancies shall include the use, or intended use, of two or more separate portions of a building by units of occupancy of different classifications.

Size and Type of Multiple Occupancy Buildings

Par. 4021. The type and size of a building, or a fire division thereof, with multiple occupancies, shall be governed by its principal occupancy, that is, any occupancy which occupies over 50 per cent of the volume of the building or fire division in which it is located. Where there is no principal occupancy, the governing occupancy shall be that occupancy requiring the greatest protection.

Separation of Multiple Occupancies

Par. 4023. Units of occupancy of a multiple occupancy shall be separated as required in Section 407.

Building Requirements for Multiple Occupancy

Par. 4025. The requirements for each unit of occupancy in a building with multiple occupancy shall be regulated by the respective chapter for the occupancy of that unit.

Changes of Multiple Occupancies

Par. 4026. Any change in a multiple occupancy shall be in accordance with Section 406.

Existing Multiple Occupancies

Par. 4028. Non-conforming existing multiple occupancies shall be regulated by the requirements for existing occupancies in Section 404.

Maintenance of Multiple Occupancies

Par. 4029. The maintenance of multiple occupancies shall be regulated by the maintenance requirements of each class of occupancy in the multiple occupancy, and where contradictions or absurdities occur, the regulations providing the greater safety shall govern.

SECTION 403

MIXED OCCUPANCIES

Scope of Mixed Occupancies

Par. 4030. Mixed occupancies shall include the use, or intended use, of every building, or portion thereof, by two or more classes of occupancy in such a way that they cannot be separated into multiple occupancies.

Classification of Mixed Occupancies

Par. 4031. A mixed occupancy shall be considered as one occupancy of that class in the mixed occupancy whose requirements provide the greater safety.

Mixed Occupancies Prohibited

Par. 4034. Mixed occupancies shall not include Public Assembly, Private Assembly, Dwelling Occupancy or Institutional Occupancy.

Change of Mixed Occupancies

Par. 4036. Any change in mixed occupancies shall be in accordance with Section 406.

Existing Mixed Occupancies

Par. 4038. Existing mixed occupancies which do not conform to the requirements of this Code shall be regulated by the requirements for existing occupancies in Section 404.

Maintenance of Mixed Occupancies

Par. 4039. The maintenance of mixed occupancies shall be regulated by the maintenance requirements of each class of occupancy in the mixed occupancy, and where contradictions or absurdities occur, the regulations providing the greater safety shall govern.

SECTION 404

EXISTING OCCUPANCIES

Scope of Existing Occupancies

Par. 4040. Existing occupancies shall include the use or designed use of any building, or part thereof, which existed previous to the adoption of this Code, or for which a certificate has been issued after the adoption of this Code.

Classification of Existing Occupancies

Par. 4041. All existing occupancies shall be classified as conforming or non-conforming occupancies.

Conforming Existing Occupancies

Par. 4042. Existing occupancies meeting the requirements of this Code shall be classified as conforming existing occupancies.

Non-Conforming Existing Occupancies of Buildings

Par. 4043. Existing occupancies of land, buildings or other structures established prior to the passage of this Code, and which do not conform to the provisions of this Code, shall be permitted to continue until there is a change of occupancy, as defined in Section 406, in which latter case the occupancy or the building shall be made to conform with this Code.

SECTION 405

DOUBTFUL OCCUPANCIES

Scope of Doubtful Occupancies

Par. 4050. Doubtful occupancies include every occupancy of such a nature that it can logically be placed in two or more classes of occupancy set forth in Section 401.

Classification of Doubtful Occupancies

Par. 4051. Every doubtful occupancy shall be classified by the Buildings Engineer by placing it in that class to which it most closely conforms or which requires the greatest protection.

Changes in a Building of Doubtful Occupancies

Par. 4056. No changes in a building with a doubtful occupancy shall be permitted until such occupancy is classified.

Disputed Classification of Doubtful Occupancies

Par. 4059. In case of dispute over the classification of doubtful occupancies, an appeal from the decision of the Buildings Engineer may be made as provided in Section 194.

SECTION 406

CHANGE OF OCCUPANCY

Scope of Change of Occupancy

Par. 4060. Change of occupancy shall include every change from one class of occupancy to another class and from one kind to a more hazardous kind in the same class.

Any change of ownership or tenancy only of a building, structure, or premises shall not be deemed a change of occupancy.

Whenever any premises, building or other structure which does not comply with the provisions of this Code is vacant for a continuous period of four years after the effective date of this Code, such vacancy shall be and constitute an abandonment of its class of occupancy, and such vacancy also shall automatically extinguish any and all rights which any person may have to continue the class of occupancy for which such premises, building or other structure was used, unless and until such premises, building or other structure is made to comply with all of the provisions of this Code relative to any new proposed occupancy.

General Requirements for Change of Occupancy

Par. 4061. No change of occupancy shall be made in any building, structure or premises unless they conform with the requirements of this Code for the proposed new occupancy.

Changes of occupancy require applications, permits and certificates in accordance with Chapters 13, 14 and 15, except that for changes in mixed occupancy they shall not be required unless so ordered by the Buildings Engineer.

SECTION 407

SEPARATION OF OCCUPANCIES

General Requirements for Separation of Occupancies

Par. 4070. Adjoining units of different occupancies, as defined in their respective Chapters, shall be separated by a separation at least as fire-resistive as specified in Paragraph 4078.

Such separations of occupancies shall consist of a system of walls, partitions, floors, or other construction of such materials and arrangement as to provide a complete, secure and continuous fire-break of the required fire-resistive rating between the portions of the building separated.

Designation of Separations

Par. 4071. The symbols used in Table 4078T to designate the required separations between occupancies shall have the following meaning:

A—Absolute Separation
4—Four-hour Separation
3—Three-hour Separation
2—Two-hour Separation
1—One-hour Separation
N—No Separation Required

Absolute Separation

Par. 4072. An absolute separation shall be a fire wall or a fire division separation as defined in Sections 598 and 599 and shall have no openings in the walls except those permitted in Paragraph 4078. Each such opening shall be protected on each side thereof by a self-closing Class A fire door.

Four-Hour Separation

Par. 4073. A four-hour separation shall provide effective fire-resistance of not less than four-hour rating and shall have no openings in the walls except those permitted in Paragraph 4078. Each such opening shall be protected on each side thereof by a self-closing Class A fire door.

All openings in floors which are required to be four-hour separations shall be protected by at least four-hour fire-resistive construction.

Three-Hour Separation

Par. 4074. A three-hour separation shall provide effective fire-resistance of not less than three-hour rating and shall have no openings in the walls except those permitted in Paragraph 4078. Each such opening shall be protected on one side thereof by a self-closing Class A fire door.

All openings in floors which are required to be three-hour separations shall be protected by at least three-hour fire-resistive construction.

Two-Hour Separation

Par. 4075. A two-hour separation shall provide effective fire-resistance of not less than two-hour rating and shall have no openings in the walls except as permitted in Paragraph 4078. Each such opening shall be protected on one side thereof by a self-closing Class B fire door or a fixed fire-resistive window.

All openings in floors which are required to be two-hour separations shall be protected by at least two-hour fire-resistive construction.

Our-Hour Separation

Par. 4076. A one-hour separation shall provide effective fire-resistance of not less than one-hour rating without restrictions as to openings. Each opening in the walls shall be protected on one side thereof by a self-closing Class C fire door or a fixed fire-resistive window.

All openings in floors which are required to be one-hour separations shall be protected by at least one-hour fire-resistive construction.

Designation of Openings in Separations

Par. 4077. The symbols used in Table 4078T to designate the permissible openings in separations between occupancies shall have the following meaning:

N.O.—no openings.
25L—one opening not over 25 square feet in area in the lobby only.
25S—one opening not over 25 square feet in area in each story.
25D—one opening not over 25 square feet in area in each story in each 50-foot section of wall or in a wall whose total length is less than 50 feet, but the distance between the centers of adjacent openings shall not be less than 50 feet.
40S—one opening not over 40 square feet in area or openings with an aggregate area not over 40 square feet, in each story.
40D—one opening not over 40 square feet in area in each 100-foot section of wall or in a wall whose total length is less than 100 feet, but the distance between the centers of adjacent openings shall be not less than 100 feet.
100S—one opening not over 100 square feet in area or openings with an aggregate area of not over 100 square feet, in each story.
N.R.—No restrictions.

Required Separations and Permitted Openings Between Occupancies

Par. 4078. Separations of occupancies and the openings therein shall be as shown in the following table wherein the symbols above and to the right of the diagonal line are defined in Paragraph 4071 and designate the required separations between occupancies. The symbols below and to the left of the diagonal line are defined in Paragraph 4077 and designate the permitted openings in separations between occupancies.

TABLE 407ST

Occupancy		Public Assembly	Private Assembly	Dwelling	Institutional	Office	Commercial			Storage			Industrial		
							Hazardous	Moderately Hazardous	Light Hazardous	Hazardous	Moderately Hazardous	Light Hazardous	Hazardous	Moderately Hazardous	Light Hazardous
Public Assembly		Note 1	4	3	3	3	A	4	3	A	A	4	A	A	4
Private Assembly		40D		3	3	2	A	3	2	A	A	4	A	A	4
Dwelling		25D	25S		2	2	A	3	§ 2	A	A	4	A	A	4
Institutional		25D	40S	40S		2	A	3	2	A	A	4	A	A	4
Office		25D	40S	100S	100S		3	2	N	3	2	N	3	2	N
Commercial	Haz.	N.O.	N.O.	25S *	N.O.	25S **		2	2	3	2	2	3	2	2
	Mod. Haz.	N.O.	25S	25S	25S	100S	100S		N	3	N	1	3	N	1
	Light Haz.	25L.	100S	100S	100S	N.R.	100S	N.R.		3	1	N	3	1	N
Storage	Haz.	N.O.	N.O.	25S *	N.O.	25S **	40S	40S	40S	Note 2	2	2	3	2	2
	Mod. Haz.	N.O.	N.O.	25S	N.O.	100S	100S	N.R.	N.R.	100S		1	3	N	1
	Light Haz.	N.O.	N.O.	25S	25S	N.R.	100S	N.R.	N.R.	100S	N.R.		3	1	N
Industrial	Haz.	N.O.	N.O.	N.O.	N.O.	25S **	40S	40S	40S	40S	40S	40S		2	2
	Mod. Haz.	N.O.	N.O.	N.O.	N.O.	100S	100S	N.R.	N.R.	100S	N.R.	NR	100S		N
	Light Haz.	N.O.	N.O.	25S	25S	N.R.	100S	N.R.	N.R.	100S	N.R.	N.R.	100S	N.R.	

Note 1—Public assembly occupancies which are in two successive stories in a building shall be separated by not less than a four-hour horizontal separation.

Note 2—No separation required, except between garages, more than 600 square feet in area or more than one-story high, and other hazardous storage occupancies which shall be not less than three-hour with openings as permitted under 40S.

*—See Paragraph 4349 for required vestibules.

**—See Paragraph 4549 for required vestibules.

§ Exception: The separation between a dwelling and light hazardous commercial occupancy in a building not over 3 stories or 35 feet in height and not over 50,000 cubic feet in volume, occupied by one tenant, shall be not lower than one hour.

CHAPTER 41

CLASS I, PUBLIC ASSEMBLY, BUILDINGS

Sec. 410—General Requirements for Public Assembly Buildings.
Sec. 411—Size and Construction of Public Assembly Buildings.
Sec. 412—Exterior Requirements for Public Assembly Buildings.
Sec. 413—Roof Requirements for Public Assembly Buildings.
Sec. 414—Interior Requirements of Public Assembly Buildings.
Sec. 415—Exit Requirements for Public Assembly Buildings.
Sec. 416—Special Interior Requirements for Public Assembly Buildings.
Sec. 417—Electrical and Mechanical Requirements for Public Assembly Buildings.
Sec. 418—Existing Public Assembly Buildings.
Sec. 419—Maintenance and Operation of Public Assembly Buildings.

SECTION 410

GENERAL REQUIREMENTS FOR PUBLIC ASSEMBLY BUILDINGS

Scope of Public Assembly Buildings

Par. 4100. Public Assembly buildings shall include every building or portion of a building designed, constructed or used as a theater, opera house, dance hall, convention hall, exhibition hall, arena, or as a place of other public assembly, and every assembly hall containing a stage equipped with a gridiron or other means of hanging scenery, and every assembly hall, except churches, in which the aggregate area of the main floor and all tiers amounts to 10,000 square feet or more.

For buildings used as bowling alleys, shooting galleries and similar purposes, refer to Paragraph 4908.

References for Public Assembly Buildings

Par. 4101. For applications, permits, certificates, inspections, violations, vacating, penalties and other administrative regulations, see Part. I.

Unusual Conditions in Public Assembly Buildings

Par. 4107. In new or existing Public Assembly buildings, where unusual conditions not specifically regulated by this Code create a fire hazard or a health menace, the Buildings Engineer shall require such additional construction, equipment or facilities as may be necessary for the protection of life or health.

Converting Into Public Assembly Buildings

Par. 4109. No building of any other class of occupancy shall be converted into a Public Assembly building unless it complies with all the requirements of this Code for new Public Asembly buildings.

SECTION 411

SIZE AND CONSTRUCTION OF PUBLIC ASSEMBLY BUILDINGS

General Construction Requirements for Public Assembly Buildings

Par. 4110. The construction of Public Assembly Buildings shall be in accordance with the type requirements in Part V and also with the requirements of this Section.

Height, Volume and Type Restrictions for Public Assembly Buildings

Par. 4111. The height and volume of every Public Assembly building shall be within the limits fixed by the following table, except as required below:

TABLE 4111 T

Type of building	Height		Maximum Volume in cubic feet
	Feet	Stories	
Fireproof	Not hereby limited		Not hereby limited
Fire-resistant	50	—	400,000
Steel Frame	45	—	200,000
Slow Burning	40	—	200,000
Ordinary	35	1	40,000
Metal	—	1	100,000
Wood Frame	30	1	25,000

One story Public Assembly buildings equipped in all parts with a Class A automatic sprinkler system may have a volume of 50 per cent more than that shown in Table 4111 T.

Public Assembly buildings shall be Type A, Fireproof, buildings if they are constructed within 100 feet of a hazardous Commercial, Storage or Industrial building, unless the latter are Type A, Fireproof, buildings, or of a filling station, pump or tank where inflammable liquids are stored or handled.

Where a Public Assembly building exceeds in volume the limits set in Table 4111 T, it shall be divided into fire divisions by separations constructed as required in Sections 598 and 599, so that the volume of each such fire division will be within such limits.

No Public Assembly room exceeding 3600 square feet in area or a group of such rooms with an aggregate area exceeding 4800 square feet shall be above the first story unless it is in a Type A, Fireproof, or Type B, Fire-resistant, building.

Special Requirements For Proscenium and Other Interior Walls in Public Assembly Buildings

Par. 4113. In every Public Assembly building having an auditorium and a permanent stage equipped with a gridiron or other means for hanging scenery, and primarily adapted for the giving of plays, operas, or similar forms of entertainment, the stage shall be separated from the auditorium by a fire division separation, as defined in Sections 598 and 599, except that in Type A, Fireproof, and Type B, Fire-resistant, buildings, such separation shall be not lower than of two-hour fire resistive construction. Other permanent stages on which scenery is intended to or may be used, or any stage without scenery, but more than 15 feet deep, shall be separated from the auditorium by at least a two-hour fire-resistive construction. Openings in such separation shall be permitted only as follows: One proscenium opening, which shall be protected as required in Paragraph 4165; not more than 2 openings at the orchestra pit level and not more than 2 openings at the auditorium floor or stage level, none of which shall be more than 25 square feet in area, except that in auditoriums not over 5000 square feet in area, without fixed seats, openings leading under the stage shall not be limited in area. All such openings, except the proscenium opening, shall be protected on each side thereof by Class A fire doors.

The separation between stage and auditorium shall extend from the foundation to at least 30 inches above the highest roof, except that in Type A, Fireproof, and Type B, Fire-resistant, buildings, it shall extend at least to the underside of such roof slab and form an effective fire seal therewith.

Stages or platforms less than 15 feet wide without provisions for scenery need not be separated from the auditorium.

Toilet rooms, smoking rooms, lounges, dressing rooms, and similar rooms shall be separated from the other portions of the building by at least two-hour fire-resistive construction, with the openings therein protected by Class C fire doors or fire-resistive windows.

Every workshop, storage room, and property room shall be separated from the stage or any other portion of the building by walls of not less than three-hour fire-resistive construction, with the openings therein protected by Class B fire doors.

The enclosing walls of projection booths shall be as required in Paragraph 4162.

Fixed partitions or walls constructed of wood or other combustible materials shall not be permitted in Public Assembly buildings, except in Type G, Wood frame, and Type E, Ordinary, buildings.

Special Requirements for Floors in Public Assembly Buildings

Par. 4114. The floor immediately above any basement in every Public Assembly building, regardless of its type, shall be as required for the floors in Type A, Fireproof, buildings, except that in Type E, Ordinary, Type F, Metal and Type G, Wood Frame, buildings, such floors may be as required for floors in Type B, Fire-resistant, buildings.

Special Requirements for Ceilings in Public Assembly Buildings

Par. 4115. Where ceilings are used under the roof in Public Assembly buildings they shall be of not lower than one-hour fire-resistive construction.

Special Requirements for Balconies in Public Assembly Buildings

Par. 4116. Balconies and mezzanines over 5,000 square feet in area in Type A, Fireproof, Public Assembly buildings shall be constructed as required for the principal floors of such buildings.

Balconies and mezzanines 5,000 square feet and less in area in Type A, Fireproof, Public Assembly buildings shall be constructed as required for the principal floors in Type B, Fire-resistant, Public Assembly buildings.

Balconies and mezzanines in all other types of Public Assembly buildings shall be constructed as required for the principal floors of the type in which they occur.

Stage Construction in Public Assembly Buildings

Par. 4117. The construction of any enclosed stage in a Public Assembly building shall be as required for the main floors of the type of building in which it occurs, except that the portion of the stage floor for a width not greater than the proscenium opening plus 3 feet on each side and extending from the proscenium opening to the backwall of the stage may be of wood with a finished thickness of not less than one and five-eighths inches, supported on unprotected steel beams or timber not less than 4 inches thick.

Where a stage or platform is not enclosed, its construction shall be the same as required for the auditorium floor, or it may be of wood if the auditorium floor extends under the full area of such stage or platform.

The space under a stage of less than three-hour fire-resistive construction shall not be used for storage or for any purpose other than the working of traps and mechanical apparatus necessary for a performance on the stage, except that in auditoriums not over 5,000 square feet in area, without fixed seats, such space may be used for the storage of seats.

Gridiron and Fly Gallery Construction in Public Assembly Buildings

Par. 4118. The fly galleries in Public Assembly buildings shall be made of incombustible materials and the floors shall be solid. The pin rails shall be made of iron or steel and the gridirons shall be made of steel or other incombustible material. The fireproofing of metal is not required.

Special Requirements for Exterior Openings in Public Assembly Buildings

Par. 4119. The distance from any window or other opening in the exterior wall of a Public Assembly building, or unit, to any door, with an area exceeding 45 square feet, leading directly into a garage, or into a unit of hazardous Commercial, Storage or Industrial occupancy, shall meet the following requirements:

a. Such distance above the top, or the level of the top for a distance of 5 feet beyond the sides, of said door shall be not less than 10 feet and such distance from any side of said door shall be not less than 5 feet.

b. When such distance above the top, or the level of the top for a distance of 10 feet beyond the sides, of said door is less than 20 feet and such distance from any side of said door is less than 10 feet, the said window or other opening shall be protected by a fixed fire-resistive window or a Class D fire door.

Whenever the distance from any said window or other opening to any door with an area of 45 square feet or less or any window or other opening in the exterior wall of a garage or a hazardous Commercial, Storage or Industrial building or unit is less than 5 feet at any side or less than 10 feet below the bottom of said window or other opening, the said window or other opening shall be protected by a fixed fire-resistive window or a Class D fire door.

SECTION 412

EXTERIOR REQUIREMENTS FOR PUBLIC ASSEMBLY BUILDINGS

Entrances to Public Assembly Buildings

Par. 4121. The level of any entrance floor of every Public Assembly building shall be at the same elevation as the sidewalk at the entrance.

The aggregate width of an entrance doorway shall be not less than the required width, as specified in Section 415, of the exit in which it is placed.

Projections from Public Assembly Buildings

Par. 4122. Marquees, signs, footings and other similar projections, on or of every Public Assembly building, projecting beyond the building lines into a street or other public way shall be in accordance with Chapter 21.

Courts for Public Assembly Buildings

Par. 4123. Courts in exits of Public Assembly buildings shall be considered passageways and shall be in accordance with the applicable regulations pertaining to passageways in exits.

SECTION 413

ROOF REQUIREMENTS FOR PUBLIC ASSEMBLY BUILDINGS

Scuttles and Bulkheads on Public Assembly Buildings

Par. 4135. Every Public Assembly building more than one story or 20 feet in height shall have a permanent means of access to the roof from the inside. The opening shall be not less than 24 by 36 inches and there shall be a permanent ladder or stairway leading thereto. When such a building contains a stage equipped with a gridiron or other means for hanging scenery, a scuttle shall also be placed in the roof accessible from the stage.

Ventilators on Public Assembly Buildings

Par. 4136. In Public Assembly buildings there shall be one or more ventilators, constructed of metal or other incombustible material, near the center and above the highest part of every stage having a gridiron or other means for hanging scenery. Such ventilator or ventilators shall be raised not less than one foot above the stage roof and shall have a total ventilating area equal to not less than 10 per cent of the undivided horizontal area behind the curtain.

Doors or covers for ventilators shall be equipped with non-corroding hardware and shall open by gravity and shall be held closed or normally operated by means of cords extending to each side of the stage. These cords shall be equipped with three fusible links, one of which shall be placed at the ventilator above the main roof line, and the other two at points not affected by sprinkler heads. Fusible links shall be of an approved type which will fuse and separate by a temperature of not more than 160 degrees Fahrenheit.

Glass, if used in ventilators, may be either plain or wired. If plain glass is used, a suitable wire netting, constructed as required in Paragraph 7664, shall be placed above and below the glass.

Skylights on Public Assembly Buildings

Par. 4137. Skylights are not required in Public Assembly buildings, but, if installed, they shall be constructed in accordance with Section 766.

Roof Drainage on Public Assembly Buildings

Par. 4138. The roof surface of every Public Assembly building shall be arranged so as to drain directly to gutters or leaders. Roofs having parapet walls which will impound water shall be provided with scuppers not less than 8 by 12 inches, one for each 1,000 square feet of roof, or fraction thereof. No scuppers shall be placed in any parapet wall which is facing and is less than 5 feet from any adjoining property line.

Gutters and Downspouts on Public Assembly Buildings

Par. 4139. Gutters and leaders shall be provided on Public Assembly buildings to properly conduct the water from the roofs thereof where necessary to prevent damage to any property. Water from any part of a building shall not be allowed to fall or flow on a public footway, except from window sills, copings and cornices, not more than one foot wide and from awnings or marquees discharging off the outer edge.

SECTION 414

INTERIOR REQUIREMENTS OF PUBLIC ASSEMBLY BUILDINGS

Scope of Interior Requirements of Public Assembly Buildings

Par. 4140. This section includes the requirements for arranging and constructing the entrance lobbies, auditoriums, balconies, basements, furnace rooms, machinery rooms and toilet rooms, shafts, vertical openings and garages in Public Assembly buildings.

Entrance Lobbies in Public Assembly Buildings

Par. 4141. Entrance lobbies in Public Assembly buildings shall have a width as required in Paragraph 4156 and a clear height of not less than 8 feet.

The width of exits from passenger elevator lobbies in the first story shall be not less than one foot for every 50 square feet, or major fraction thereof, of elevator car area discharging into the lobby. The width of such exits shall be added to the width of other exits which they may join.

Heights of Assembly Rooms in Public Assembly Buildings

Par. 4142. The ceiling height above the main floor of an auditorium or other assembly room shall not be less than 18 feet but shall be such that there will be not less than 100 cubic feet of space for every 6 square feet of the aggregate area in all tiers.

Balconies and Boxes in Public Assembly Buildings

Par. 4143. There shall be not more than 3 balconies above the main floor of the auditorium of any Type A, Fireproof, Public Assembly building. In Type B, Fire-resistant, Public Assembly buildings, two balconies shall be permitted. In Public Assembly buildings, of lower fire-resistiveness, than Type B, Fire-resistant, only one balcony with an area not exceeding 50 per cent of the main floor area shall be permitted.

The clear height under the first balcony shall be not less than 10 feet at any point. The clear height from the floor of any balcony to the balcony next above shall be not less than 8 feet at any point and not less than 10 feet from the highest point of the floor of the uppermost balcony to the lowest part of the ceiling over that balcony.

All parts of boxes shall be of the same construction as required for the type of building in which they are located.

Balustrades shall be constructed as required for fixed partitions.

Orchestra Pits in Public Assembly Buildings

Par. 4144. The orchestra pit shall be separated from the auditorium by a railing of incombustible material if the floor of the pit is below the auditorium floor.

Furnace and Machinery Rooms in Public Assembly Buildings

Par. 4146. Furnace rooms, power rooms, and rooms for fuel storage shall be completely enclosed and separated from all other portions of a Public Assembly building by not lower than three-hour fire-resistive construction, with each opening therein protected by a Class A fire door. There shall be at least two self-closing Class A fire doors intervening in each passageway or line of travel between a furnace room and the auditorium.

Furnace and power rooms shall have no direct connection with any stairway or other means of egress from the building.

For required machinery rooms of refrigerating systems, refer to Chapter 96.

Toilet Rooms in Public Assembly Buildings

Par. 4147. Every Public Assembly building shall have at least one toilet room for men and one for women which shall be clearly marked "Men" or "Women".

Toilet rooms shall be of a size sufficient to provide room for the equipment as required in Paragraph 4178.

Separate compartments shall be provided for each water-closet, where more than one water-closet, or a water-closet and a urinal or urinals are placed in the same toilet room.

Every room or compartment containing a water-closet shall be not less than 33 inches wide and there shall be a clear space at least 18 inches wide directly in front of the water-closet.

All floors in toilet rooms shall have a waterproof non-absorbent finish. Walls and ceilings of toilet rooms shall be smoothly finished.

Shafts and Vertical Openings in Public Assembly Buildings

Par. 4148. All shafts shall be enclosed in all stories of Public Assembly buildings, except that the stairways serving dressing rooms need not be enclosed above the stage or first floor if separated from the stage by at least two-hour fire-resistive construction with all openings therein protected by Class B fire doors or fixed fire-resistive windows.

Stairways which pierce only one floor, and other single openings, shall be enclosed in the story above or below, except that such stairways in required exits from one story which is not a basement shall be enclosed in the other story.

All enclosures shall be in accordance with the type requirements of Part V.

Garages and Other Hazardous Occupancies in Public Assembly Buildings

Par. 4149. All garages, regardless of size, and all units of hazardous Commercial, Storage or Industrial occupancy attached to or in Public Assembly buildings, shall be constructed in all parts as required for Type A, Fireproof, buildings and separated from the Public Assembly buildings as required for hazardous occupancies in Section 407.

Exterior openings serving such a garage not exceeding 600 square feet in area and not over one story in height shall meet the requirements of Paragraph 4716 for larger garages.

SECTION 415

EXIT REQUIREMENTS FOR PUBLIC ASSEMBLY BUILDINGS

General Exit Requirements for Public Assembly Buildings

Par. 4150. Every Public Assembly building shall be provided with safe and unobstructed exits, in accordance with the requirements of this Section. When unusually hazardous conditions and conditions not covered by this Code exist in any Public Assembly building, the Buildings Engineer shall order additional exit facilities to assure the safety of the occupants thereof.

No required exit shall discharge from a Public Assembly area by means of upward travel through a vertical distance of more than 24 feet in Type A, Fireproof, or Type B, Fire-resistant, buildings, nor more than 12 feet in other types of buildings.

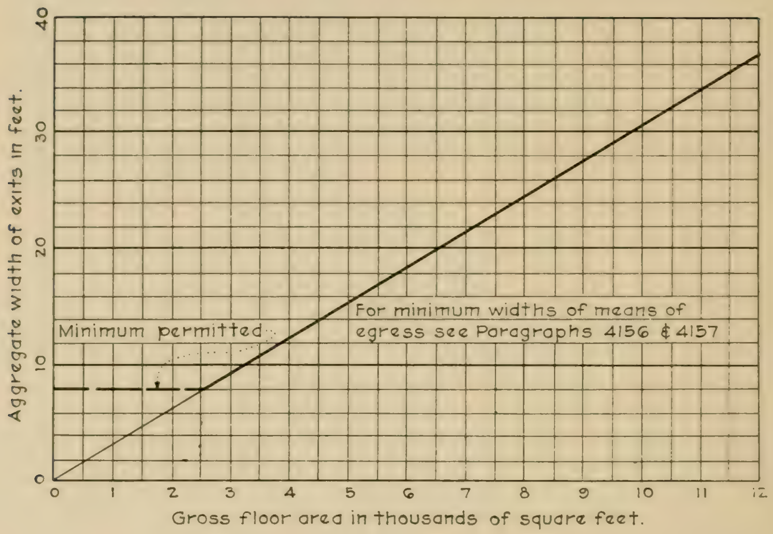
Where Public Assembly uits are in Type A, Fireproof, or Type B, Fire-resistant, buildings, with other occupancies, at least half of the required exits from such Public Assembly units shall be entirely separated from the exits from any other portions of the building. Where required exits from the Public Assembly units are joined with the exits from other occupancies, the width of the common exit shall equal the sum of the width of the exits so joined. In other types of buildings, all required exits from Public Assembly units shall be entirely separated from the exits leading from any other portions of the building.

For exits from elevator lobbies, see Paragraph 4141.

Width of Exits in Public Assembly Areas

Par. 4151. The aggregate width of exits from every main floor, tier, balcony or other area used or designed to be used for Public Assembly shall be not less than that shown graphically on the following diagram, but no such exit shall be less than 48 inches wide, except where otherwise specifically permitted.

DIAGRAM 4151D



Location and Number of Exits in Public Assembly Areas

Par. 4152. Every main floor, tier, balcony, or other area, used, or designed to be used, for Public Assembly, and every story, shall have at least two exits separated and as remote as possible from each other, except where otherwise permitted, but the location and number of exits shall be such that the distance a person must travel from any point to reach an exit from such areas in the various types of buildings shall not exceed that given in Column 1 of the following table. However, the distance a person must travel from any point from which exits may be reached in one direction only, to a point from which exits may be reached in two basically different directions, shall not exceed that shown in Column 2. Where there are fixed seats, the starting point of a travel path may be considered to be in an aisle.

TABLE 4152T

Type of building	Column 1	Column 2
Fireproof	100 feet	20 feet
Fire-resistant	75 “	20 “
Steel Frame	50 “	15 “
Slow Burning	50 “	15 “
Ordinary	40 “	10 “
Metal	50 “	15 “
Wood Frame	25 “	10 “

In cases where the minimum aggregate width of exits as required by Paragraph 4151 is not sufficient to provide the number of exits needed to satisfy the requirements of this Paragraph for maximum distance of travel to them, additional exits shall be provided.

Approximately one-half of the required aggregate width of exits shall be on each side of an axis which bisects an assembly area, and placed as required in this Paragraph.

Not more than one-half of the exit width furnished on each side of such axis shall be permitted to be joined into a common means of egress on the floor or tier served.

No exit from any balcony shall lead into an auditorium.

Not more than one-half of the required exit width from the first balcony above the main entrance floor shall be permitted to lead directly into a lobby on the first floor or into any other exit from the first floor.

Exits from all balconies above the first shall be separated in the building from the exits from the main floor and first balcony.

Where exits from different floor levels are joined into one means of egress, its width shall be not less than the sum of the required widths of such exits.

For a tier of boxes, and for a balcony, with an area less than 150 square feet, only one exit, not less than 30 inches wide, shall be required.

Stage Exits in Public Assembly Buildings

Par. 4153. Every stage 1000 square feet or less in area shall have at least one exit not less than 3 feet wide on each side. Every stage over 1000 square feet in area shall have not less than 3 independent exits, each not less than 4 feet wide, one in the rear, and one on each side of the stage. Such exits shall not lead through the auditorium.

Every fly gallery and gridiron shall be provided with not less than 2 exits, one on each side of the stage, leading directly to the stage exits.

Each tier of dressing rooms shall be provided with at least 2 exits not less than 3 feet wide, remote from each other, and separated entirely from the stage proper.

Exits from Auxiliary Rooms and Basements in Public Assembly Buildings

Par. 4154. Lounges, smoking rooms, toilet rooms and other public rooms, offices, dressing rooms, workshops, storage rooms, furnace rooms, power rooms, and other service rooms in Public Assembly buildings shall not be required to have more than one exit, but such rooms which are more than 1600 square feet in area shall have at least two exits as remote as possible from each other. Such exits shall not be less than 30 inches wide, except for public rooms more than 3000 square feet in area, and shall be so arranged that no point in such rooms will be more than 50 feet, measured along the exit path, from a means of egress therefrom.

Exits from rooms, except toilet and cloak rooms, shall not lead through other rooms, except that from rooms with two or more exits one exit may lead through another room provided with the required exits.

Public rooms 3000 square feet or more in area shall be provided with exits as required for Public Assembly areas, Paragraphs 4151 and 4152.

The exits from all basements, cellars, or fire divisions thereof, shall be not less than 30 inches wide and at least one exit shall lead directly to a street or an open space leading to a street. Where such areas are more than 1000 square feet they shall have at least two exits, as remote as possible from each other. Where assembly rooms are located in basements, the exits shall conform to Paragraphs 4151 and 4152.

Where two exits are required from furnace rooms and power rooms located in the basement, at least one exit shall lead directly to a street or to an open space leading to a street.

Every occupant of a story, including basements, shall at all times have access to at least two remote exits from the story, except where only one exit is required.

Exits from Motion Picture Booths in Public Assembly Buildings

Par. 4155. Every motion picture booth shall be provided with an exit doorway not less than 24 inches wide. Where the clear space behind any projector is less than 36 inches wide, two such exits, remote from each other, shall be provided. There shall be no point in a booth more than 20 feet from an exit.

Required Means of Egress in Public Assembly Buildings

Par. 4156. The required exits in Public Assembly buildings shall consist of one or more doorways, passageways, lobbies, interior stairways, fire towers or ramps, or any combination of them, constructed in accordance with Chapters 76 and 77. Such means of egress shall be as follows:

Doorways: The clear width of a single doorway or the aggregate clear width of a multiple doorway shall not be less than the required width of the exit in which it is placed.

Passageways: The clear width of a passageway shall not be less than the required width of the exit in which it is placed.

Lobbies of all Public Assembly buildings shall be considered as means of egress in the exits in which they are placed. The width of a lobby shall be not less than the total required width of all exits leading to it, plus an additional 5 feet for every exit leading into it from the sides. The passage through a lobby shall be as direct as possible, and sharp turns on less than a 20 foot radius curve shall not be permitted. For each opening from every lobby to a ticket office, cloak-room or other similar room, 2 feet shall be added to the exit width of the lobby.

Interior Stairways and Fire Towers: The width of such stairways, as defined in Paragraph 7722, shall not be less than the required width of the exit in which they are placed. No stairway serving upper stories shall be continued below the first floor level, unless they are enclosed in the basement and discharge into an enclosed means of egress leading directly to the street from the basement.

Ramps shall comply with all the requirements for stairways that are applicable.

Conditional Means of Egress in Public Assembly Buildings

Par. 4157. Conditional means of egress, constructed in accordance with Chapters 76 and 77, shall be permitted only to provide additional exits in existing Public Assembly buildings with inadequate exits, or where, in buildings hereafter erected, it is unreasonable or impracticable to construct required means of egress, but only upon the approval of the Buildings Engineer. Such means of egres shall be as follows:

Horizontal Exits: The clear width of such means of egress forming a horizontal exit shall be at least equal to that of the required exit in which it is placed. There shall be one or more exits leading directly to a street, from a story or fire division on each end of a horizontal exit, the aggregate width of which shall be at least equal to the width of the horizontal exit. The areas on each end of a horizontal exit shall be occupied by the same tenant or passageways leading to the exits shall be continuously available to the different tenants of such areas.

Exterior Stairways: The width of exterior stairways shall be as required for interior stairways. Such stairways shall be permitted only where at least two required means of egress remote from each other are available from the story or tier. Open exterior stairways shall not be permitted on buildings over 7 stories or 75 feet high.

Exterior Ramps shall comply with all the requirements for exterior stairways that are applicable.

Moving Stairs or Escalators of the horizontal tread type, which operate normally in the direction of exit travel, may be substituted for an equal width of stairway or ramp but for not more than 25 per cent of the required width of exits from the area served. Escalators shall be 48 inches wide.

Passenger Elevators may be given credit as exits by considering each unit of capacity of 25 persons per minute, from the highest loading area, equivalent to one foot of required exit width as determined from the solid line in Diagram 4151D, but not more than 25 per cent of such required exit width shall be substituted by elevators.

Ladders may be permitted only in exits from fly galleries, gridirons, from furnace and machinery rooms in the basement, and for access to roofs.

Emergency Means of Egress in Public Assembly Buildings

Par. 4158. Emergency means of egress, such as revolving doors, sliding chutes, standard steel fire escapes, spiral stairs, ladders in locations other than those permitted in Paragraph

4157, poles and other means of egress not included in Paragraphs 4156 and 4157, shall not be permitted as means of egress in any Public Assembly building.

Exit Signs in Public Assembly Buildings

Par. 4159. All exits in Public Assembly Buildings shall be indicated by internally illuminated signs at all times when the building is occupied. Where exit signs are not visible from every point on a floor area, directional signs indicating the exits shall be provided. Directional signs shall also be placed along the line of exits.

For the Requirements of exit and directional signs, refer to Paragraph 7891.

SECTION 416

SPECIAL INTERIOR REQUIREMENTS FOR PUBLIC ASSEMBLY BUILDINGS

Scope of Special Interior Requirements for Public Assembly Buildings

Par. 4160. This section includes the requirements for aisles, seats, projection booths, interior finish, draperies, acoustical treatment, proscenium curtains, stage scenery, dressing rooms and lounges in Public Assembly buildings.

Aisles and Seats in Public Assembly Buildings

Par. 4161. The aisles in the auditorium of every Public Assembly building shall be made in as direct a line and as nearly at right angles to the rows of seating as possible. Their ends most remote from the stage shall terminate at exit doors.

Aisles with seats on both sides shall have a minimum width of 3 feet, and those with seats on only one side shall have a minimum width of 2 feet. The minimum width of all aisles with exits on one end only shall be increased from the enclosed end toward the exit end at the rate of 3 inches for every 10 feet of length. All aisles with exits, such as exit doorways, corridors, passageways or cross-aisles, on both ends, shall have a uniform width equal to not less than the minimum width herein required plus one and one-half inches for each 10-foot length of aisle, measured between cross-aisles or other exits. Whenever an aisle borders on an exit, its minimum width shall be added to the required width of the exit. Aisles may be sloped or stepped. If sloped, the maximum gradient shall be one in five and if stepped, the steps shall conform to the requirements for stairs in Paragraphs 7726 and 7727. Steps shall extend the full width of the aisle and shall be adequately and clearly lighted.

Cross-aisles shall be provided on the main floor of auditoriums having more than 35 rows of seats. The first cross-aisle shall be distant not more than 18 rows of seats from the stage end or front of the auditorium, and not more than 35 rows of seats shall be permitted between cross-aisles. Such cross-aisles shall have a width at least equal to that of the widest aisles they intersect, in the clear, when seats are down, and shall extend across the entire auditorium, leading on both ends to exits that are easily accessible.

A cross-aisle shall be provided in all balconies distant not more than 7 rows of seats from the front. Additional cross-aisles shall be provided distant not more than 14 rows of seats from the next lower cross-aisle, except that, if the last cross-aisle is placed at the rear of the balcony, there may be 16 rows of seats between it and the next lower cross-aisle. Such cross-aisle shall be at least 4 feet wide in the clear and shall be separated from the seating spaces by suitable railings. They shall extend the full width of the balcony and terminate on both ends at exits.

Seats, except in boxes, shall be securely fastened to the floor and shall be placed not less than 32 inches back to back, measured horizontally, and not less than 18 inches, center to center. There shall be not more than 17 seats in a row between aisles and not more than 9 in a row between an aisle and a wall.

The floor for each row of seats shall not be more than 21 inches higher than that immediately in front of it and never less than 32 inches wide. The plane of the aisle and that of the floor for each row of seats shall be so arranged as to eliminate vertical projections at the entrance to each row of seats.

Movable bleacher seats shall be of a design and construction meeting the approval of the Buildings Engineer. They shall have foot boards at least 16 inches wide and shall be erected only on finished floors. They shall be used only for temporary seating and shall not be erected in the following locations:

a. On any floor above the main entrance floor of Types C, D, E, F and G buildings.

b. On any floor which is of lower than two-hour fire-resistive rating.

c. In any story below the first unless the floor immediately above is of two-hour fire-resistive rating.

Projection Booths in Public Assembly Buildings

Par. 4162. Projection booths shall be of at least three-hour fire-resistive construction. The booths shall be so located that no door or other opening thereof shall adjoin or open directly upon any required exit from a Public Assembly area.

The clear ceiling height shall be at least 8 feet. The booth shall be large enough to permit a working space of at least 2 feet 6 inches on either side of and at least 2 feet in the rear of each projector, spot light, or other machine.

There shall be not more than 2 openings in the booth in front of each projector, one for the operator's view, which shall not exceed 200 square inches in area, and one through which the picture is projected, which shall not exceed 8 inches in its greatest dimension. Where separate spot or flood light machines are installed in the same booth with projectors, not more than one opening for each such machine shall be provided for both the operator's view and the projection of the light, and no such opening shall exceed 300 square inches in area.

Door openings in the booth shall be equipped with self-closing Class A fire doors. Projection and other openings shall be protected by shutters constructed of solid steel plate at least one-eighth inch thick or of any material of equal fire-resistiveness which shall overlap the openings at least one inch on all sides. Shutters shall be held in the closed position by gravity, spring hinges, or equivalent devices. All shutters which are normally held open during the operation of the projectors, spotlights, floodlights, or similar equipment shall be so arranged that all such openings may be closed manually at any projector head, spotlight or similar equipment, and shall automatically close should the room temperature adjacent to the top magazine of any projector exceed 165 degrees Fahrenheit.

Ventilation for the booth shall be provided by means of outlets at one or more points in the ceiling connected to vent pipes with connections to the lamp housing of each projector. The vent pipe shall be of metal, substantially constructed and with all joints made by riveting, welding or other similar approved method and shall lead to the outside of the building or to a special incombustible duct. It shall be kept at least one inch from combustible material or shall be separated therefrom by incombustible, heat insulating material not less than one-half inch in thickness. Draft in the booth shall be maintained by an exhaust fan or other approved means having a capacity of at least 200 cubic feet per minute for each 80 square feet of floor area of the booth.

Fresh air inlets with registers with a combined area equal to the vent outlets shall be provided in the walls of the booth, placed not more than 8 inches above the floor line. Such supply registers shall be not more than 6 inches in height and shall be covered with metal screens or grilles and protected by shutters as heretofore described.

Any shelves that may be placed in the booth shall be of incombustible materials.

If there is a radiator in the booth, it shall be covered with substantial wire mesh on an iron frame. The top shall be sloped so that it cannot be used as a shelf.

Vaults for the storage of films shall not communicate with booths and shall be constructed in accordance with Paragraph 4464.

Acoustical Materials in Public Assembly Buildings

Par. 4163. Acoustical materials shall be permitted on the walls and ceilings of auditoriums in Public Assembly buildings, provided they are of approved manufacture, which will not ignite easily. No acoustical material shall be placed nearer than 8 feet from the floor.

All acoustical material shall be securely cemented to fire-resistive construction.

Combustible acoustical material shall not be placed in any building other than Type A, Fireproof, or Type B, Fire-resistant.

Interior Finish in Public Assembly Buildings

Par. 4164. The trim on the walls, ceilings, or other parts of auditoriums, other assembly halls, orchestra pits, lobbies, foyers, and promenades in Public Assembly buildings shall be of incombustible materials, except that hard wood shall be permitted for hand railings, floor finish, wash boards, and picture or panel moulding, and that wood, or other not highly combustible material, in the form of a veneer one-twentieth of an inch or less in thickness, shall be permitted as a wall covering, and as permitted in Paragraph 4163 for acoustical material.

The projections on both sides of the proscenium opening, both ornamental and structural, shall be constructed of incombustible material securely fastened in place. Sheet metal work shall be permitted if the space between it and the wall is filled with incombustible and non-heat-conducting material.

Proscenium Curtain in Public Assembly Buildings

Par. 4165. Proscenium openings shall be provided with curtains as follows:

Where stages Are Equipped With a Gridiron or Other Means of Hanging Scenery:

a. The curtain shall be of asbestos fabric reinforced with wire, or of other approved material, mounted on a rigid steel frame, the entire assembly having a fire-resistive rating of at least one hour.

Other Stages Where Scenery is Used:

b. For proscenium openings more than 35 feet wide, the curtain shall be as required in (a).

c. For proscenium openings 35 feet or less but more than 25 feet wide or more than 12 feet high, the curtain shall be of asbestos fabric reinforced with wire or of other approved material, of not less than one-hour fire-resistive rating, with a rigid metal member at the top and at the bottom edge.

d. For proscenium openings 25 feet or less in width or 12 feet or less in height, the curtain shall be either of asbestos fabric or of cotton or other fabric, flame-proofed by an approved chemical process.

Stages More than 15 *Feet Deep Where no Scenery is Used*:

e. For proscenium openings over 40 feet wide, the curtain shall be as required in (a).

f. For proscenium openings 40 feet or less but more than 25 feet in width, the curtain shall be as required in (c).

g. For proscenium openings 25 feet or less in width the curtain shall be as required in (d).

The proscenium curtains specified under items (a), (b), (c), (e) and (f) shall overlap the sides of the opening at least 18 inches and extend into incombustible grooves, the edges of the curtain being retained in the groove by means of a taut steel cable or by other approved means. The curtain shall overlap the top of the proscenium opening not less than 18 inches. At the bottom edge the curtain shall be padded for a depth of at least 4 inches with flexible incombustible material. The proscenium curtain shall be so rigged, counterbalanced, and operated that it can be quickly released to descend by gravity, and completely close the opening in case of fire. The releasing device and its location shall be approved by the Buildings Engineer.

Stage Scenery and Fittings in Public Assembly Buildings

Par. 4166. All stage scenery, projection screens, and decorations made of combustible material, and all woodwork on or about the stage, shall be painted or chemically treated by an approved process so that they shall not ignite easily or actively support combustion.

Dressing Rooms in Public Assembly Buildings

Par. 4167. Dressing rooms may be placed in the rear or on either side of the stage, or under the stage, but shall not be placed in the auditorium.

All windows in dressing rooms shall be arranged to open and none of the windows in outside walls shall have fixed sash, iron grilles or bars.

The walls and floors between dressing rooms and auditorium shall be unpierced.

Built-in dressing room furniture and fixtures shall be incombustible.

Lounges in Public Assembly Buildings

Par. 4168. Lounges located under the first balcony shall be open at both ends and directly accessible to exits.

Draperies in Public Assembly Buildings

Par. 4169. For regulations pertaining to draperies, see the Fire Prevention Code of Baltimore City.

SECTION 417

ELECTRICAL AND MECHANICAL REQUIREMENTS FOR PUBLIC ASSEMBLY BUILDINGS

Scope of Electrical and Mechanical Requirements in Public Assembly Buildings

Par. 4170. This Section includes the requirements for fire extinguishing appliances, heating and ventilation, air conditioning, fire alarm, lighting, plumbing and other electrical and mechanical equipment for Public Assembly buildings.

Fire Extinguishing Appliances in Public Assembly Buildings

Par. 4171. In every Public Assembly building, automatic Class B sprinklers shall be installed on every stage requiring proscenium walls, under such stage floors, in the basement, in property rooms, dressing rooms, store rooms, workshops and paint rooms.

The proscenium opening shall be protected with automatic sprinklers so installed as to form, when in operation, a complete water curtain across the whole opening.

Standpipes forming a part of a standard system shall be provided back of the proscenium wall on every stage over 1000 square feet in area, so located that no point on the stage will be more than 50 feet from a standpipe. Public Assembly areas of more than 6000 square feet shall have not less than two such standpipes, one on each side of the assembly area, but there shall be sufficient standpipes so located that no point in such area shall be more than 130 feet from a hose station.

On every standpipe, hose stations, equipped with a two and one-half inch hose, shall be located at each floor, balcony, tier, fly gallery, gridiron level and at each basement level. In the first fire zone standpipes in any part of a building more than 70 feet high shall be extended above the roof and equipped with at least one hose outlet.

At least one two-and-one-half gallon capacity Class A portable fire extinguisher shall be provided for each 3000 square feet or fraction thereof of an assembly area, and on each stage, conveniently placed. One two-and-one-half gallon capacity Class A portable fire extinguisher shall be placed in each projection room.

Firm Alarms in Public Assembly Buildings

Par. 4173. Every Public Assembly building more than 6000 square feet in area or more than 50 feet in height shall have a method of direct communication with the headquarters of the general fire alarm system of the City, for the purpose of promptly sounding an alarm in case of fire.

Air Conditioning in Public Assembly Buildings

Par. 4174. Air conditioning is not required, but if installed, it shall comply with the regulations in Chapter 95.

Heating and Ventilation in Public Assembly Buildings

Par. 4175. Every Public Assembly building shall be provided with a heating system capable of maintaining a temperature of at least 70 degrees Fahrenheit when the outside temperature is zero and the building is unoccupied.

All auditoriums, assembly halls, foyers, lobbies and other public rooms shall be equipped with a mechanical ventilating system capable of providing not less than one cubic foot of fresh air per minute per one and one-half square feet of aggregate floor area of main floors, balconies and tiers. All other rooms used by human beings shall be provided with windows or skylights with an open area of at least one-sixteenth of the floor area or with a mechanical ventilating system as required for public rooms.

Lighting in Public Assembly Buildings

Par. 4176. All parts of every Public Assembly building shall be equipped with artificial lighting facilities to provide not less than 3 foot-candles of illumination at the floor. Such lighting facilities shall be electrically operated.

Electrical Requirements in Public Assembly Buildings

Par. 4177. The construction and installation of all electrical appliances, equipment and wiring in Public Assembly buildings shall comply with the requirements of Part VIII.

Plumbing Requirements in Public Assembly Buildings

Par. 4178. Every Public Assembly building shall have at least one water closet for males and one for females, for every 2000 square feet of assembly area or fraction thereof. Two urinals may be substituted for one water closet provided for males, but for never more than one-third of the required number of such water closets.

Separate water closets shall be provided for the men and women employed back of the proscenium wall for every stage over 1000 square feet in area.

One lavatory shall be provided for every two water closets and for every four urinals, but at least one in each toilet room.

Separate drinking fountains shall be provided for the stage and auditorium. One approved sanitary drinking fountain shall be provided at each floor level to each 10,000 square feet of floor area or fraction thereof. No such fountain shall be placed in a toilet room.

SECTION 418

EXISTING PUBLIC ASSEMBLY BUILDINGS

Non-Conforming Construction of Public Assembly Buildings

Par. 4181. When a Public Assembly Building, whose type or construction is not in conformity with the provisions of this

Code, is altered or reconstructed in such a manner that the type or construction thereof is affected, any and all parts of such Public Assembly Building affected by the alteration or reconstruction shall be made to conform to all of the requirements of this Code for type and construction of New Public Assembly Buildings, or as near thereto as the Buildings Engineer may deem reasonable. Repairs on such Public Assembly Buildings are permitted without conforming to this Code.

Non-Conforming Arrangement of Public Assembly Buildings

Par. 4184. Where, in an existing Public Assembly building, the interior arrangement is not in conformity with the provisions of this Code, it shall be made to conform to the requirements of this Code for the interior arrangement in a new Public Assembly building, if such non-conforming arrangement constitutes an imminent hazard to life or property.

However, when a Public Assembly building is altered or reconstructed in such a manner that the interior arrangement thereof is changed, the new arrangement shall be made to conform as nearly as possible to the requirements of this Code for the interior arrangement in a new Public Assembly building.

Non-Conforming Exits in Public Assembly Buildings

Par. 4185. Where, in an existing Public Assembly building, the exits or means of egress are not in conformity with the provisions of this Code, they shall be made to conform with the requirements of this Code for exits and means of egress in new Public Assembly buildings, if such non-conforming exits or means of egress are a hazard to life.

However, when a Public Assembly building is altered or reconstructed in such a manner that the exits or means of egress therein are affected, or the means of egress therein are renewed or altered, all such exits or such means of egress shall be made to conform to the requirements of this Code for exits and means of egress in new Public Assembly buildings.

Non-Conforming Fire Protection in Public Assembly Buildings

Par. 4186. Where standpipe systems, as required by this Code for new Public Assembly buildings, are not installed in existing Public Assembly buildings, standpipes shall be installed as required for new Public Assembly buildings, or a two and one-half gallon portable Class A fire extinguisher shall be conveniently located in every place where a hose station is required. In all other respects, all fire extinguishing equipment shall be provided in every existing Public Assembly building, or made to conform to the requirements of this Code for new Public Assembly buildings.

Non-Conforming Electrical and Mechanical Equipment in Public Assembly Buildings

Par. 4187. Where, in an existing Public Assembly building, the electrical and mechanical equipment does not conform to the provisions of Part IV of this Code, such equipment shall be made to conform, except as hereinafter provided, to the requirements of Part IV of this Code for the electrical and mechanical equipment of new Public Assembly buildings, if such non-conforming equipment or the absence of such equipment constitutes an imminent menace to life or health.

However, when such non-conforming electrical and mechanical equipment is altered, any and all parts of such equipment affected by the alteration, shall be made to conform to the requirements of this Code for electrical and mechanical equipment in new Public Assembly buildings.

SECTION 419

MAINTENANCE AND OPERATION OF PUBLIC ASSEMBLY BUILDINGS

General Maintenance of Public Assembly Buildings

Par. 4191. Every Public Assembly building and all parts thereof shall be kept in good repair and in a safe condition while in use or any other time when the lack of maintenance affects adjoining property; the roof and walls shall be kept so as not to leak; and all means of draining rain water therefrom shall be kept so as not to cause dampness in the walls, ceilings, or basements. All devices or safeguards which are required by this Code when the buildings are erected, altered or repaired shall be maintained in good working order.

All self-closing fire doors shall be kept normally closed. Automatic fire doors and their operating devices shall at all times be maintained in working order.

Exits, and other means of escape when permitted, shall be maintained at all times in good, safe, usable condition.

The enforcement of all fire prevention regulations shall be by the Fire Department.

The enforcement of all sanitary regulations shall be by the Health Department.

General Operation of Public Assembly Buildings

Par. 4192. The operation of Public Assembly buildings shall be under the supervision of the Fire Department and the Health Department.

Maintenance and Operation of Fire Protection in Public Assembly Buildings

Par. 4194. The maintenance and operation of fire extinguishing appliances and equipment in Public Assembly buildings shall be under the supervision of the Fire Department, who shall also enforce all regulations pertaining thereto. Refer to Chapter 98.

Maintenance and Operation of Heating and Ventilation in Public Assembly Buildings

Par. 4195. Refer to Part IX for regulations governing the maintenance of heating and ventilating equipment in Public Assembly buildings. The operation of such equipment shall be under the supervision of the Health Department, who shall also enforce all regulations pertaining thereto.

Maintenance and Operation of Plumbing in Public Assembly Buildings

Par. 4196. The maintenance and operation of plumbing in Public Assembly buildings shall be under the supervision of the Health Department, who shall also enforce all regulations pertaining thereto.

Maintenance and Operation of Other Electrical and Mechanical Equipment in Public Assembly Buildings

Par. 4197. All other electrical and mechanical equipment in Public Assembly buildings, including all such equipment not specifically required by this Code, shall be maintained and operated so that, at all times, it will meet the requirements of this Code, and will not constitute a life or fire hazard.

CHAPTER 42

CLASS II, PRIVATE ASSEMBLY, BUILDINGS

Sec. 420—General Requirements for Private Assembly Buildings.
Sec. 421—Size and Construction of Private Assembly Buildings.
Sec. 422—Exterior Requirements for Private Assembly Buildings.
Sec. 423—Roof Requirements for Private Assembly Buildings.
Sec. 424—Interior Arrangement of Private Assembly Buildings.
Sec. 425—Exit Requirements for Private Assembly Buildings.
Sec. 426—Other Interior Arrangements for Private Assembly Buildings.
Sec. 427—Electrical and Mechanical Requirements for Private Assembly Buildings.
Sec. 428—Existing Private Assembly Buildings.
Sec. 429—Maintenance and Operation of Private Assembly Buildings.

SECTION 420

GENERAL REQUIREMENTS FOR PRIVATE ASSEMBLY BUILDINGS

Scope of Private Assembly Buildings

Par. 4200. Private Assembly buildings shall include every building, or portion of a building, designed, constructed or used as a church, school, parish house, club house, or as a place of similar private assembly.

A unit of private assembly occupancy having an area of 400 square feet or less, which is in another occupancy, shall be considered to have the same occupancy as that in which it occurs.

References for Private Assembly Buildings

Par. 4201. For applications, permits, certificates, inspections, violations, vacating, penalties and other administrative regulations, see Part I.

Unusual Conditions in Private Assembly Buildings

Par. 4207. In new or existing Private Assembly buildings, where unusual conditions not specifically regulated by this Code create a fire hazard or a health menace, the Buildings Engineer shall require such additional construction, equipment or facilities as may be necessary for the protection of life or health.

Converting Into Private Assembly Buildings

Par. 4209. No building of any other class of occupancy shall be converted into a Private Assembly building unless it complies with all the requirements of this Code for new Private Assembly buildings.

SECTION 421

SIZE AND CONSTRUCTION OF PRIVATE ASSEMBLY BUILDINGS

General Construction Requirements for Private Assembly Buildings

Par. 4210. The construction of Private Assembly buildings shall be in accordance with the type requirements in Part V and also with the requirements of this Section.

Height, Volume and Type Restrictions for Private Assembly Buildings

Par. 4211. The height and volume of Private Assembly buildings shall be within the limits fixed by the following table, except as further restricted below:

TABLE 4211T

Type of building	Height		Maximum volume in cubic feet
	Feet	Stories	
Fireproof	Not hereby limited		Not hereby limited
Fire-resistant	75	6	1,000,000
Steel Frame	40	3	800,000
Slow Burning	40	3	600,000
Ordinary	35	2	300,000
Metal	30	2	300,000
Wood Frame	25	1	100,000

Private Asembly buildings shall be Type A, Fireproof, buildings if they are constructed within 100 feet of a hazardous Commercial, Storage or Industrial building, unless the latter are Type A, Fireproof, buildings, or of a filling station, pump or tank where inflammable liquids are stored or handled.

Where a Private Assembly building exceeds in volume the limits set in Table 4211T, it shall be divided into fire divisions by separations constructed as required in Sections 598 and 599, so that the volume of each such fire division will be within such limits.

No private Assembly room exceeding 3600 square feet and no group of such rooms with an aggregate area exceeding 4800 square feet shall be above the first story unless they are in a Type A, Fireproof, or Type B, Fire-resistant, building.

Exceptions for Exterior Walls of Private Assembly Buildings

Par. 4212. The following exceptions are permitted only for Type B, Fire-resistant, Type C, Steel Frame, buildings, and for Type E, Ordinary, buildings, with all structural members, floor and roof construction of incombustible materials, and where all such buildings are not over 3 stories or 35 feet in height, and not over 100,000 cubic feet in volume, and are used for Private Assembly:

The exterior walls of such buildings are not required to be in accordance with Paragraphs 5221, 5321 and 5521, but may be of incombustible materials protected against corrosion and constructed to have a three-hour fire-resistive rating for outside exposures and a two-hour rating for inside exposures, except where such walls are facing and within 3 feet of any adjoining property line or opposite alley line.

Requirements for Proscenium Walls in Private Assembly Buildings

Par. 4213. Stages in Private Assembly buildings shall be separated from the auditorium as required for stages in Public Assembly buildings, in Paragraph 4113.

The proscenium opening shall be protected as required in Paragraph 4165.

Workshops, storage rooms and property rooms shall be separated as required for such rooms in Public Assembly buildings in Paragraph 4113.

Special Requirements for Floors in Private Assembly Buildings

Par. 4214. The floor immediately above any basement in every Private Assembly building, regardless of its type, shall be constructed as required for the floors of Type A, Fireproof, buildings, except that in Type E, Ordinary, Type F, Metal, and Type G, Wood Frame, buildings, such floors may be as required for the floors in Type B, Fire-resistant, buildings.

Special Requirements for Ceilings in Private Assembly Buildings

Par. 4215. Where ceilings are used under the roof in Private Assembly buildings they shall be of not lower than one-hour fire-resistive construction.

Special Requirements for Balconies in Private Assembly Buildings

Par. 4216. Balconies and mezzanines over 5000 square feet in area in Type A, Fireproof, Private Assembly buildings shall be constructed as required for the principal floors of such buildings.

Balconies and mezzanines 5000 square feet and less in area in Type A, Fireproof, buildings shall be constructed as required for the principal floors in Type B, Fire-resistant, buildings.

Balconies and mezzanines in all other types of buildings shall be constructed as required for the principal floors of the type in which they occur.

Stage Construction in Private Assembly Buildings

Par. 4217. In every Private Assembly building the construction of any enclosed stage shall be as required for the main floors of the type of building in which it occurs, except that the portion of the stage floor for a width not greater than the proscenium opening plus 3 feet on each side and extending from the proscenium opening to the back-wall of the stage may be of wood with a finished thickness of not less than one and five-eighths inches, supported on unprotected steel beams or timber not less than 4 inches thick.

Where a stage or platform is not enclosed, its construction shall be the same as required for the auditorium floor, or it may be of wood if the auditorium floor extends under the full area of such stage or platform.

The space under a stage of less than three-hour fire-resistive construction shall not be used for storage or for any other purpose except that in auditoriums not over 5000 square feet in area, without fixed seats, such space may be used for the storage of seats.

Gridiron and Fly Gallery Construction in Private Assembly Buildings

Par. 4218. Gridirons and fly galleries shall not be permitted in private assembly halls or auditoriums unless such halls or auditoriums are construced in accordance with the requirements of Chapter 41.

Special Requirements for Exterior Openings in Private Assembly Buildings

Par. 4219. The distance from any window or other opening in the exterior wall of a Private Assembly building, or unit, to any door, with an area exceeding 45 square feet, leading directly into a garage, or into a unit of hazardous Commercial, Storage or Industrial occupancy, shall meet the following requirements:

a. Such distance above the top, or the level of the top for a distance of 5 feet beyond the sides, of said door shall be not less than 10 feet and such distance from any side of said door shall be not less than 5 feet.

b. When such distance above the top, or the level of the top for a distance of 10 feet beyond the sides, of said door is less than 20 feet and such distance from any side of said door is less than 10 feet, the said window or other opening shall be protected by a fixed fire-resistive window or a Class D fire door.

Whenever the distance from any said window or other opening to any door with an area of 45 square feet or less or any window or other opening in the exterior wall of a garage or a hazardous Commercial, Storage or Industrial building or unit is less than 5 feet at any side or less than 10 feet below the bottom of said window or other opening, the said window or other opening shall be protected by a fixed fire-resistive window or a Class D fire door.

SECTION 422

EXTERIOR ARRANGEMENTS FOR PRIVATE ASSEMBLY BUILDINGS

Entrances to Private Assembly Buildings

Par. 4221. Main entrances to a Private Assembly building shall be at least equal in width to that required for the exits in which they are placed.

Projections from Private Assembly Buildings

Par. 4222. Marquees, signs, footings and other similar projections, on or of every Private Assembly building, projecting beyond the building lines into a street or other public way shall be in accordance with Chapter 21.

Courts for Private Assembly Buildings

Par. 4223. Courts in exits of Private Assembly buildings shall be considered passageways and shall be in accordance with the applicable regulations pertaining to passageways in exits.

SECTION 423

ROOF REQUIREMENTS FOR PRIVATE ASSEMBLY BUILDINGS

Scuttles and Bulkheads on Private Assembly Buildings

Par. 4235. Required scuttles in the roof of a Private Assembly building shall be in accordance with Paragraph 4253.

Skylights on Private Assembly Buildings

Par. 4237. Skylights are not required in Private Assembly buildings, but, if installed, they shall be constructed in accordance with Section 766.

Roof Drainage on Private Assembly Buildings

Par. 4238. The roof surface of every Private Assembly building shall be arranged so as to drain directly to gutters or leaders. Roofs having parapet walls which will impound water shall be provided with scuppers not less than 8 by 12 inches, one for each 1,000 square feet of roof, or fraction thereof. No scuppers shall be placed in any parapet wall which is facing and is less than 5 feet from any adjoining property line.

Gutters and Downspouts on Private Assembly Buildings

Par. 4239. Gutters and leaders shall be provided on Private Assembly buildings to properly conduct the water from the roofs thereof where necessary to prevent damage to any property. Water from any part of any such building shall not be allowed to fall or flow on a public footway, except from window sills, copings and cornices, not more than one foot wide, and from awnings or marquees discharging off the outer edge.

SECTION 424

INTERIOR ARRANGEMENT OF PRIVATE ASSEMBLY BUILDINGS

Scope of Interior Arrangements of Private Assembly Buildings

Par. 4240. This Section includes the requirements for arranging and constructing the entrance lobbies, assembly rooms, balconies, classrooms, basements, furnace rooms, machinery rooms, and toilet rooms, shafts, vertical openings and garages in Private Assembly buildings.

Entrance Lobbies in Private Assembly Buildings

Par. 4241. Entrance lobbies in Private Assembly buildings shall have a width as required in Paragraph 4256 and a clear height of not less than 8 feet.

The width of exits from passenger elevator lobbies in the first story shall be not less than one foot for every 50 square feet, or major fraction thereof, of elevator car area discharging into the lobby. The width of such exits shall be added to the width of other exits which they may join.

Heights of Rooms in Private Assembly Buildings

Par. 4242. The ceiling height above the main floor of any Private Assembly room shall not be less than 10 feet, except in classrooms, where the ceiling height shall be at least 12 feet, and except in manual training, domestic science, play and recreation rooms where such height shall be at least 8 feet.

Balconies in Private Assembly Buildings

Par. 4243. There shall be not more than 3 balconies above the main floor of assembly rooms of any Type A, Fireproof, Private Assembly building. In Type B, Fire-resistant, Private Assembly buildings, 2 balconies shall be permitted. In Private Assembly buildings of lower fire-resistiveness than Type B, Fire-resistant, only one balcony with an area not exceeding 50 per cent of the main floor area shall be permitted.

The clear height under the first balcony shall be not less than 10 feet at any point. The clear height from the floor of any balcony to the balcony next above shall be not less than 8 feet at any point and not less than 10 feet from the highest point of the floor of the uppermost balcony to the lowest part of the ceiling over that balcony.

Classrooms in Private Assembly Buildings

Par. 4244. The minimum floor space of classrooms in Private Assembly buildings shall be 14 square feet per person.

The tops of windows shall not be placed more than 8 inches below the minimum ceiling height. Window sills shall be from 36 to 42 inches above the floor; for school grades above the fourth, such height shall be 42 inches.

Basements in Private Assembly Buildings

Par. 4245. Where classrooms and rooms for worship, religious instructions and recreation in Private Assembly buildings are placed in the basement, all floors and walls thereof in contact with earth shall be waterproofed. The required window area for classrooms shall be above the adjacent finished grade line without the use of areas or retaining walls.

Furnace and Machinery Rooms in Private Assembly Buildings

Par. 4246. Furnace rooms, power rooms and rooms for fuel storage shall be completely enclosed and separated from all other portions of a Private Assembly building by not lower than three-hour fire-resistive construction, with each opening therein protected by a Class A fire door. There shall be at least two self-closing Class A fire doors intervening in each passageway or line of travel between a furnace room and the auditorium.

Furnace and power rooms shall have no direct connection with any stairway or other means of egress from the building.

For required machinery rooms of refrigerating systems, refer to Chapter 96.

Toilet Rooms in Private Assembly Buildings

Par. 4247. Every Private Assembly building shall have at least one toilet room for each sex using the building located in every 10,000 square feet of floor area, or fraction thereof, except churches 5,000 square feet or less in area, where only one toilet room is required. Each toilet room shall be clearly marked to indicate the sex for which it is intended.

Toilet rooms shall be of a size sufficient to provide room for the equipment as required in Paragraph 4278.

Separate compartments shall be provided for each water closet, where more than one water closet, or a water closet and a urinal or urinals are placed in the same toilet room.

Every room or compartment containing a water-closet shall be not less than 33 inches wide and there shall be a clear space at least 18 inches wide directly in front of the water-closet.

All floors in toilet rooms shall have a waterproof non-absorbent finish. Walls and ceilings of toilet rooms shall be smoothly finished.

Shafts and Vertical Openings in Private Assembly Buildings

Par. 4248. All shafts shall be enclosed in all stories of Private Assembly buildings, except that the stairways serving dressing rooms need not be enclosed above the stage or first floor if separated from the stage by at least a two-hour fire-resistive construction with all openings protected by Class B fire doors or fixed fire-resistive windows.

Stairways which pierce only one floor and other single openings shall be enclosed in the story above or below, except that such stairways in required exits from one story which is not a basement shall be enclosed in the other story.

Exceptions to the above regulations are stairways in Type A, Fireproof, or Type B, Fire-resistant, school buildings not over 3 stories high, which need not be separated from the corridors.

All enclosures shall be in accordance with the type requirements of Part V.

Garages and Other Hazardous Occupancies in Private Assembly Buildings

Par. 4249. All garages, regardless of size, and all units of hazardous Commercial, Storage or Industrial occupancy attached to or in Private Assembly buildings, shall be constructed in all parts as required for Type A, Fireproof, buildings and separated from the Private Assembly buildings as required for hazardous occupancies in Section 407.

Exterior openings serving such a garage not exceeding 600 square feet in area and not over one story in height shall meet the requirements of Paragraph 4716 for larger garages.

SECTION 425

EXIT REQUIREMENTS FOR PRIVATE ASSEMBLY BUILDINGS

General Exit Requirements for Private Assembly Buildings

Par. 4250. Every Private Assembly building or part of a building used for Private Assembly shall be provided with safe and unobstructed exits, in accordance with the requirements of this Section. When unusually hazardous conditions and conditions not covered by this Code exist in any Private Assembly building the Buildings Engineer shall order additional exit facilities to assure the safety of the occupants thereof.

For exits from elevator lobbies, see Paragraph 4241.

Width of Exits in Private Assembly Areas

Par. 4251. The aggregate width of exits from every room, tier, balcony, other area, or group of such areas, used or designed to be used for Private Assembly, shall be not less than that shown graphically on the following diagrams. The width of each exit shall be not less than the total required width divided by the number of exits, but never less than 42 inches, except where otherwise specifically permitted.

DIAGRAM 4251D1

For areas in which no room is larger than 1000 square feet.

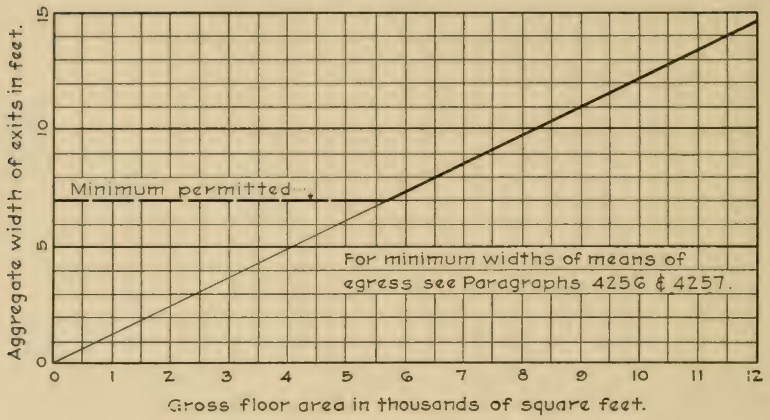
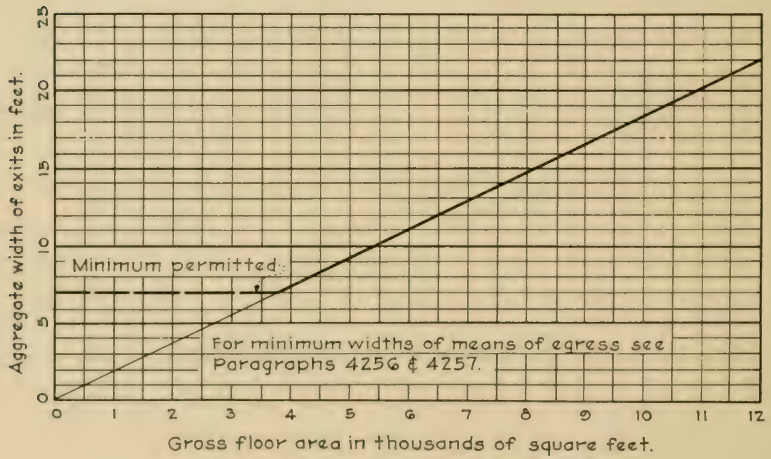


DIAGRAM 4251D2

For areas in which each room or auditorium has an aggregate assembly area of more than 1000 square feet, but less than 10,000 square feet, and for all churches.



16 The width of exits from auditoriums, except churches, with an aggregate assembly area of 10,000 square feet or more, shall be as required for Public Assembly areas.

The aggregate area of all rooms, except toilet rooms, cloak rooms and corridors, in a story, shall be used to obtain, from the respective diagrams, the aggregate width of the exits from that story.

The required width of exits shall not be reduced in the direction of exit travel.

The exits from one story shall be permitted to be joined with the exits from the story immediately above, without adding the widths of such exits, but the number of exits, as required in the following Paragraphs, shall not be reduced.

Location and Number of Exits in Private Assembly Areas

Par. 4252. Every story, room, tier or balcony, or other area, used, or designed to be used, for Private Assembly, shall have at least two exits separated and as remote as possible from each other, except where otherwise permitted in Paragraph 4255, but the location and number of exits shall be such that the distance a person must travel from any point to reach an exit from the story, in the various types of buildings, shall not exceed that given in Column 1 of the following table; however, the distance a person must travel from any point from which exits may be reached in one direction only, to a point from which exits may be reached in two basically different directions, shall not exceed that shown in Column 2. The starting point of a travel path may be considered to be in an aisle, where there are fixed seats, and at the corridor entrance door of a room or group of rooms whose area does not exceed 1,000 square feet.

TABLE 4252T.

Type of building	Column 1	Column 2
Fireproof	150 feet	30 feet
Fire-resistant	125 “	25 “
Steel Frame	60 “	20 “
Slow Burning	60 “	20 “
Ordinary	50 “	15 “
Metal	60 “	20 “
Wood Frame	30 “	10 “

In cases where the minimum aggregate width of exits as required by Paragraph 4251 is not sufficient to provide the number of exits needed to satisfy the requirements of this Paragraph for maximum distance of travel to them, additional exits shall be provided. Not more than one-half of the required exits from a story shall lead into the same lobby or passageway after leaving the story.

In Private Assembly rooms more than 2000 square feet in area, approximately one-half of the required aggregate width of exits shall be on each side of an axis which bisects the room, and placed as required in this Paragraph.

Not more than one-half of the exit width furnished on each side of such axis shall be permitted to be joined into a common means of egress on the floor or tier served.

Not more than one-half of the required exit width from a balcony shall be permitted to lead directly into a common lobby or passageway on the floor below, except that all of the exits from a balcony not over 1000 square feet in area may lead into a lobby or passageway with two exits leading in opposite directions.

Balconies less than 150 square feet in area shall not be required to have more than one 30-inch wide exit.

Every occupant of a story shall have access to at least two remote exits from that story.

Roof Exits in Private Assembly Buildings

Par. 4253. A flat roof intended to be occupied by persons shall be considered a room and a story and exits shall be provided accordingly.

Access to flat roofs on Private Assembly buildings, ordinarily not occupied, shall be provided as follows:

a. From top stories 1500 square feet or less in area, one stairway not less than 24 inches wide, or a scuttle not less than 2 feet by 3 feet.

b. From top stories more than 1500 square feet but not over 6000 square feet in area, one stairway not less than 24 inches wide and another such stairway or a ladder remote from the first stairway.

c. From top stories over 6000 square feet in area, the two most remote stairways of the building shall be extended to the roof to form an exit not less than 24 inches wide.

Basement Exits in Private Assembly Buildings

Par. 4254. The exits from all basements, cellars, or fire divisions thereof in Private Assembly buildings, shall be not less than 30 inches wide and at least one exit shall lead directly to a street or an open space leading to a street. Where such areas are more than 1000 square feet they shall have at least two exits, as remote as possible from each other.

Where assembly rooms are located in basements, the exits shall conform to the requirements of Paragraphs 4251 and 4252.

Where two exits are required by Paragraph 4255 from furnace rooms and power rooms which are located in the basement, at least one such exit shall lead directly to a street or to an open space leading to a street.

Every occupant of a basement shall at all times have access to at least two remote exits, except where only one exit is required.

Room Exits in Private Assembly Buildings

Par. 4255. Private assembly rooms 1000 square feet or less in area shall not be required to have more than one exit which shall be at least 36 inches wide. Assembly rooms more than 1000 square feet in area shall have exits in accordance with Paragraphs 4251 and 4252, and also with the applicable requirements of this Paragraph.

Offices, dressing rooms, workshops for building maintenance, storage rooms, furnace rooms, power rooms, other service rooms and toilet rooms shall not be required to have more than one exit, which shall be at least 30 inches wide, but such rooms which are more than 1600 square feet in area shall have at least two 30-inch exits as remote as possible from each other. The exits shall be so arranged that no point in any such room will be more than 50 feet, measured along the exit path, from a means of egress therefrom. The travel distance from the corridor entrance door of such rooms to a means of egress from the story shall not exceed that given in Table 4252T.

Exits from rooms, except toilet and cloak rooms, shall not lead through other rooms, except that from rooms with two or more exits one exit may lead through another room provided with the required exits.

Stage exits shall be in accordance with the requirements for stage exits in Public Assembly buildings, Paragraph 4153.

Exits from motion picture booths shall be as required in Paragraph 4155.

Required Means of Egress in Private Assembly Buildings

Par. 4256. The required exits in Private Assembly buildings shall consist of one or more doorways, passageways, lobbies, interior stairways, fire towers or ramps, or any combination of them, constructed in accordance with Chapters 76 and 77. Such means of egress shall be as follows:

Doorways: The clear width of a single doorway or the aggregate clear width of a multiple doorway shall not be less than the required width of the exit in which it is placed.

Passageways: The clear width of a passageway shall be not less than the required width of the exit in which it is placed.

Lobbies of all Private Assembly buildings shall be considered as means of egress in the exits in which they are placed. The width of a lobby shall be not less than the total required width of all exits leading to it, plus an additional 5 feet for every exit leading into it from the sides. The passage through a lobby shall be as direct as possible and sharp turns on less than a 20 foot radius curve shall not be permitted. For each opening from every lobby to a ticket office, checkroom, or other similar room, 2 feet shall be added to the exit width of the lobby.

Interior Stairways and Fire Towers: The width of such stairways, as defined in Paragraph 7722, shall not be less than the required width of the exit in which they are placed. No stairway serving upper stories shall be continued below the first floor level, unless they are enclosed in the basement and discharge into an enclosed means of egress leading directly to the street from the basement.

Ramps shall comply with all the requirements for stairways that are applicable.

Conditional Means of Egress in Private Assembly Buildings

Par. 4257. Conditional means of egress, constructed in accordance with Chapters 76 and 77, shall be permitted only to provide additional exits in existing Private Assembly buildings with inadequate exits, or where, in buildings hereafter erected, it is unreasonable or impracticable to construct required means of egress, but only upon the approval of the Buildings Engineer. Such means of egress shall be as follows:

Horizontal Exits: The clear width of each means of egress forming a horizontal exit shall be at least equal to that of the required exit in which it is placed. There shall be one or more exits leading directly to a street, from a story or fire division on each end of a horizontal exit, the aggregate width of which shall be at least equal to the width of the horizontal exit. The areas on each end of a horizontal exit shall be occupied by the same tenant or passageways leading to the exits shall be continuously available to the different tenants of such areas.

Exterior Stairways: The width of exterior stairways shall be as required for interior stairways. Such stairways shall be permitted only where at least two required means of egress, remote from each other, are available from the story or tier. Open exterior stairways shall not be permitted on buildings over 7 stories or 75 feet high.

Exterior Ramps shall comply with all the requirements for exterior stairways that are applicable.

Moving Stairs or Escalators of the horizontal tread type, which operate normally in the direction of exit travel, may be substituted for an equal width of stairway or ramp, but for not more than 50 per cent of the required width of exits from the area served. Escalators shall be 48 inches wide.

Passenger Elevators may be given credit as exits by considering each unit of capacity of 35 persons per minute, from the highest loading area, equivalent to one foot of required exit width as determined from the solid line in Diagram 4251D, but not more than 25 per cent of such required exit width shall be substituted by elevators.

Standard Steel Fire Escapes may be permitted on existing buildings only.

Revolving Doors may be permitted at the rate of one revolving door to one foot of required exit width, as determined from the diagram in Paragraph 4251, except that Type B doors, as defined in Paragraph 7640, shall not be permitted to constitute more than 50 per cent of the width of each exit. Revolving doors shall not be placed within 10 feet of the foot of any stairway.

Sliding Chutes may be permitted in schools and other Private Assembly buildings where occupants are active and under rigid discipline. Each chute may be considered equivalent to 44 inches of stairway width, but chutes shall not be substituted for more than 50 per cent of the required width of all stairways from the area served.

Ladders may be permitted only in exits from furnace and machinery rooms in the basement, and for access to roofs.

Emergency Means of Egress in Private Assembly Buildings

Par. 4258. Emergency means of egress, such as spiral stairs, ladders, in locations other than those permitted in Paragraph 4257, poles, and other means of egress not included in Paragraphs 4256 and 4257, are not permitted as means of egress in any Private Assembly Building, except as hereinafter permitted for school buildings.

In existing school buildings, where additional exits are required under the conditions stated in Paragraph 4250, and it is unreasonable or impracticable to construct required or conditional means of egress, spiral stairs and poles may be permitted or ordered by the Buildings Engineer.

Exit Signs in Private Assembly Buildings

Par. 4259. All exits in Private Assembly buildings, except from rooms less than 2000 square feet in area, shall be indicated by signs at all times when the building is occupied. Where exit signs are not visible from every point on a floor area, directional signs indicating the exits shall be provided. Directional signs shall also be placed along the line of exits.

For the requirements of exit and directional signs, refer to Paragraphs 7891 and 7892.

SECTION 426

OTHER INTERIOR ARRANGEMENTS FOR PRIVATE ASSEMBLY BUILDINGS

Scope of Other Interior Arrangements for Private Assembly Buildings

Par. 4260. This Section includes the requirements for aisles, seats, projection booths, interior finish, draperies, acoustical treatment, proscenium curtains, stage scenery, dressing rooms and lounges in Private Assembly buildings.

Aisles and Seats in Private Assembly Buildings

Par. 4261. The spacing, aisles and cross-aisles for fixed seating in Private Assembly rooms shall be in accordance with the regulations of Paragraph 4161, with the exceptions in the following buildings and rooms:

Schools: All class rooms shall have aisles at both side walls and at the front and rear of the room.

In all class rooms there shall be not less than 5 feet between the front row of seats or desks and the wall, for the entire width of the room; no furniture of any kind shall be placed in this space except the necessary desk and seat for the instructor. Center aisles in class rooms shall be not less than 17 inches wide in elementary schools, 18 inches wide in junior high schools, 20 inches wide in high schools, and 24 inches wide in all other schools.

Wall aisles shall be not less than 28 inches wide in elementary schools, 30 inches wide in junior high schools, 36 inches wide in high schools and all other schools.

The aisle widths shall be clear widths from the side of the adjacent seats or desks to the nearest fixed wall, radiator, unit ventilator or other furniture or apparatus, and no such radiator, unit ventilator or other furniture or apparatus shall project from the wall toward the aisle space more than 14 inches.

Churches: In churches, the width of seats measuring from center to center of arms shall be not less than 20 inches.

If pews or benches are used, the number of seats shall be established on the basis of one seat to each 15 inches of length or major fraction thereof.

All seats on the main floor and balcony shall be spaced not less than 2 feet 6 inches from back to back, measuring horizontally.

On a pew or bench there shall be not more than 7 seats between any seat and an aisle.

All pews, benches or rows of other seats on the main floor shall be fixed on level runs not less than 30 inches wide. Aisles sloping more than 1 to 15 shall have steps in accordance with Paragraphs 7726 and 7727.

Aisles with seats on both sides shall have a minimum width of 3 feet, and those with seats on only one side shall have a minimum width of 2 feet. The minimum width of all aisles with exits on one end only shall be increased from the closed end toward the exit end at the rate of 3 inches for every 10 feet of length. All aisles with exits, such as exit doorways, corridors, passageways, or cross-aisles, on both ends, shall have a uniform width equal to not less than the minimum width herein required plus one and one-half inches for each 10-foot length of aisles, measured between cross-aisles or other exits.

Where main aisles do not lead directly to the exits, cross-aisles not less in width than that of the widest intersecting aisle, measured from back to front of seats, shall be provided, intersecting with main and wall aisles and leading directly to exits on both ends.

The spacing, aisles and cross-aisles for chairs or other movable seats shall conform to all requirements for fixed seats.

Movable bleacher seats shall be of a design and construction meeting the approval of the Buildings Engineer. They shall have foot boards at least 16 inches wide and shall be erected only on finished floors. They shall be used only for temporary seating and shall not be erected in the following locations:

a. On any floor above the main entrance floor of Types C, D, E, F and G buildings.

b. On any floor which is of lower than two-hour fire-resistive rating.

c. In any story below the first unless the floor immediately above is of two-hour fire-resistive rating.

Projection Booths in Private Assembly Buildings

Par. 4262. Projection booths in Private Assembly buildings shall be of at least two-hour fire-resistive construction.

In all other respects, projection booths in Private Assembly buildings shall be constructed as required in Paragraph 4162.

Acoustical Materials in Private Assembly Buildings

Par. 4263. Acoustical materials shall be permitted on the walls and ceilings of auditoriums in Private Assembly buildings, provided that they are of approved manufacture, which will not ignite easily. No acoustical material shall be placed nearer than 8 feet from the floor.

All acoustical material shall be securely cemented to fire-resistive construction.

Combustible acoustical material shall not be placed in any Private Assembly building unless they are Type A, Fireproof, or Type B, Fire-resistant buildings.

Interior Finish in Private Assembly Buildings

Par. 4264. The interior trim of Private Assembly buildings shall conform to the requirements for the type of construction of the building.

Proscenium Curtain in Private Assembly Buildings

Par. 4265. Proscenium curtains in Private Assembly buildings shall be as required for Public Assembly buildings in Paragraph 4165.

Stage Scenery and Fittings in Private Assembly Buildings

Par. 4266. All stage scenery, projection screens, and decorations made of combustible material, and all wood-work on or about the stage in Private Assembly buildings shall be painted or chemically treated by an approved process so that they shall not ignite easily or actively support combustion.

Dressing Rooms in Private Assembly Buildings

Par. 4267. Dressing rooms in Private Assembly buildings may be placed in the rear or on either side of the stage, or under the stage, but shall not be placed in the auditorium.

All windows in dressing rooms shall be arranged to open and none of the windows in outside walls shall have fixed sash, iron grilles or bars.

The walls and floors between dressing rooms and auditorium shall be unpierced.

Built-in dressing room furniture and fixtures shall be of incombustible material or of oak, maple, or other hard wood.

Lounges and Club Rooms in Private Assembly Buildings

Par. 4268. Lounges and club rooms more than 2000 square feet in area, in Private Assembly buildings, shall conform to the requirements of Private Assembly rooms.

Draperies in Private Assembly Buildings

Par. 4269. For regulations pertaining to draperies in Private Assembly buildings see the Fire Prevention Code of Baltimore City.

SECTION 427

ELECTRICAL AND MECHANICAL REQUIREMENTS FOR PRIVATE ASSEMBLY BUILDINGS

Scope of Electrical and Mechanical Requirements in Private Assembly Buildings

Par. 4270. This Section includes the requirements for fire extinguishing appliances, heating and ventilation, air conditioning, fire alarm, lighting, plumbing and other electrical and mechanical equipment for Private Assembly buildings.

Fire Extinguishing Appliances in Private Assembly Buildings

Par. 4271. In every Private Assembly building, automatic Class A sprinklers shall be installed on every stage requiring proscenium walls, under such stage floors, and in every storage room with an area of more than 1000 square feet.

Every building more than 3 stories or 40 feet in height shall be equipped with a Standard standpipe system. Buildings 3 stories or 40 feet or less in height shall be equipped with a First Aid Standpipe system or with portable fire extinguishers.

Where standpipes are provided, there shall be at least one hose station in each story or fire division thereof, in each basement, balcony and tier, but the number of hose stations shall be such that 75 feet of hose will reach within 20 feet of all points in such areas.

In the First Fire Zone, standpipes in any part of the building more than 75 feet in height shall be extended above the roof and equipped with at least one hose outlet.

Where portable fire extinguishers are provided, there shall be at least one two-and-one-half gallon Class A extinguisher in each story and basement in each 3000 square feet of floor area or fraction thereof.

Fire Alarms in Private Assembly Buildings

Par. 4273. All school buildings containing more than 8 class rooms shall be provided with a manually operated fire gong not less than 8 inches in diameter.

Air Conditioning in Private Assembly Buildings

Par. 4274. Air conditioning is not required in Private Assembly buildings, but if installed, it shall comply with the regulations in Chapter 95.

Heating and Ventilation in Private Assembly Buildings

Par. 4275. Every Private Assembly building shall be provided with a heating system capable of maintaining a temperature of at least 70 degrees Fahrenheit when the outside temperature is zero.

All rooms in schools used by pupils shall be provided with windows or skylights with an open area of at least one-twelfth of the floor area or with a gravity or a mechanical ventilating system capable of providing one cubic foot of fresh air per minute for every 0.5 square foot of class rooms, recitation rooms, study rooms, toilet rooms, locker rooms and shower rooms, and every 0.67 square foot of gymnasiums, assembly, lunch and vocational rooms.

All other rooms in schools and all rooms in other Private Assembly buildings used by human beings shall be provided with windows or skylights with an open area of at least one-sixteenth of the floor area, or with a gravity or mechanical ventilating system capable of providing one cubic foot of fresh air per minute for every 0.67 square foot of assembly rooms and every square foot of all other rooms.

Lighting in Private Assembly Buildings

Par. 4276. If a Private Assembly building is intended to be occupied at times when natural light is inadequate or not available, it shall be provided with lighting facilities capable of furnishing artificial illumination of not less than 10-foot candles at a plane 30 inches above the floor in all rooms, and not less than 3 foot-candles at the floors of all corridors, exits, toilet and service rooms.

Electrical Requirements in Private Assembly Buildings

Par. 4277. The construction and installation of all electrical appliances, equipment and wiring in Private Assembly buildings shall comply with the requirements of Part VIII.

Plumbing Requirements in Private Assembly Buildings

Par. 4278. The plumbing requirements for all Private Assembly areas shall be in accordance with the requirements of Paragraph 4178, except in churches and schools:

Churches not over 5000 square feet in area shall be provided with one water closet, and all other churches shall have water closets, one for men and one for women. One lavatory shall be placed in each toilet room.

School Buildings shall have the following plumbing equipment: One water closet for every 20 females or fraction thereof, except in elementary and junior high schools, where there shall be one water closet for every 15 females or fraction thereof; one water closet and one urinal for every 40 males or fraction thereof, except in elementary and junior high schools, where there shall be one water closet and one urinal for every 30 males or fraction thereof; one lavatory shall be provided for every two water closets and for every two urinals, but at least one in every toilet room.

One sanitary drinking fountain shall be installed in each story and basement used by the pupils in each 6000 square feet of floor area or less. Drinking fountains shall not be installed in toilet rooms.

SECTION 428

EXISTING PRIVATE ASSEMBLY BUILDINGS

General Requirements for Existing Private Assembly Buildings

Par. 4280. Private Assembly buildings existing at the time this Code is adopted shall be permitted to continue if the requirements of Section 428 are complied with.

Non-Conforming Construction of Private Assembly Buildings

Par. 4281. When a Private Assembly building, whose type or construction is not in conformity with the provisions of this Code, is altered or reconstructed in such a manner that the type or construction thereof is affected, any and all parts of such Private Assembly building affected by the alteration or reconstruction shall be made to conform to all of the requirements of this Code for type and construction of new Private Assembly buildings, or as near thereto as the Buildings Engineer may deem reasonable. Repairs on such Private Assembly buildings are permitted without conforming to this Code.

Non-Conforming Arrangements of Private Assembly Buildings

Par. 4282. Non-conforming interior arrangements of existing Private Assembly buildings shall be permitted to continue if they do not create a hazard to life. Whenever such interior arrangements are altered, the new arrangements shall conform as nearly as possible to those required for new buildings, but, in any case, the alterations shall create better or safer conditions.

Non-Conforming Heating Plants in Private Assembly Buildings

Par. 4283. Non-conforming heating plants in Private Assembly buildings shall be made to conform to the requirements for new buildings upon notice from the Buildings Engineer, if they constitute a menace to the public safety or general welfare.

Non-Conforming Arrangement of Private Assembly Buildings

Par. 4284. Where, in an existing Private Assembly building, the interior arrangement is not in conformity with the provisions of this Code, it shall be made to conform to the requirements of this Code for the interior arrangement in a new Private Assembly building, if such non-conforming arrangement constitutes an imminent hazard to life or property.

However, when a Private Assembly building is altered or reconstructed in such a manner that the interior arrangement thereof is changed, the new arrangement shall be made to conform as nearly as possible to the requirements of this Code for the interior arrangement in a new Private Assembly building.

Non-Conforming Exits in Private Assembly Buildings

Par. 4285. Where, in an existing Private Assembly building, the exits or means of egress are not in conformity with the provisions of this Code, they shall be made to conform to the requirements of this Code for exits and means of egress in new Private Assembly buildings, if such non-conforming exits or means of egress are a hazard to life.

However, when a Private Assembly building is altered or reconstructed in such a manner that the exits or means of egress therein are affected, or the means of egress therein are renewed or altered, all such exits or such means of egress shall be made to conform to the requirements of this Code for exits and means of egress in new Private Assembly buildings.

Non-Conforming Fire Protection in Private Assembly Buildings

Par. 4286. Where standpipe systems are not installed in existing Private Assembly buildings but are required by this Code, standpipes shall be installed as required or a two-and-one-half gallon portable Class A fire extinguisher shall be conveniently located in every place where a hose station is required.

Where sprinkler systems are not installed in such buildings, but are required by this Code, sprinklers shall be installed upon notice from the Buildings Engineer where and as requested jointly by the Board of Fire Commissioners and the Buildings Engineer.

In all other respects, fire protection shall be made to conform to the requirements of this Code.

Non-Conforming Electrical and Mechanical Equipment in Private Assembly Buildings

Par. 4287. Where, in an existing Private Assembly building, the electrical and mechanical equipment does not conform to the provisions of Part IV of this Code, such equipment shall be made to conform, except as hereinafter provided, to the requirements of Part IV of this Code for the electrical and mechanical equipment of new Private Assembly buildings, if such non-conforming equipment or the absence of such equipment constitutes an imminent menace to life or health.

However, when such non-conforming electrical and mechanical equipment is altered, any and all parts of such equipment affected by the alteration, shall be made to conform to the requirements of this Code for electrical and mechanical equipment in new Private Assembly buildings.

Non-Conforming Plumbing in Private Assembly Buildings

Par. 4288. Plumbing in existing Private Assembly buildings not in accordance with the requirements of this Code shall be made to conform, upon notice from the Buildings Engineer, if they constitute a menace to the public safety and general welfare.

SECTION 429

MAINTENANCE AND OPERATION OF PRIVATE ASSEMBLY BUILDINGS

General Maintenance of Private Assembly Buildings

Par. 4291. Every Private Assembly building and all parts thereof shall be kept in good repair and in a safe condition while in use, or any other time when the lack of maintenance affects adjoining property; the roof and walls shall be kept so as not to leak; and all means of draining rain water therefrom shall be kept so as not to cause dampness in the walls, ceilings, or basements. All devices or safeguards which are required by this Code when the buildings are erected, altered or repaired shall be maintained in good working order.

All self-closing fire doors shall be kept normally closed. Automatic fire doors and their operating devices shall at all times be maintained in working order.

Exits, and other means of escape when permitted, shall be maintained at all times in good, safe, usable condition.

The enforcement of all fire prevention regulations shall be by the Fire Department.

The enforcement of all sanitary regulations shall be by the Health Department.

General Operation of Private Assembly Buildings

Par. 4292. The operation of Private Assembly buildings shall be under the supervision of the Fire Department and the Health Department.

Maintenance and Operation of Fire Protection in Private Assembly Buildings

Par. 4294. The maintenance and operation of fire extinguishing appliances and equipment in Private Assembly buildings shall be under the supervision of the Fire Department, who shall also enforce all regulations pertaining thereto. Refer to Chapter 98.

Maintenance and Operation of Heating and Ventilation in Private Assembly Buildings

Par. 4295. Refer to Part IX for regulations governing the maintenance of heating and ventilating equipment in Private Assembly buildings. The operation of such equipment shall be under the supervision of the Health Department, who shall also enforce all regulations pertaining thereto.

Maintenance and Operation of Plumbing in Private Assembly Buildings

Par. 4296. The maintenance and operation of plumbing in Private Assembly buildings shall be under the supervision of the Health Department, who shall also enforce all regulations pertaining thereto.

Maintenance and Operation of Other Electrical and Mechanical Equipment in Private Assembly Buildings

Par. 4297. All other electrical and mechanical equipment in Private Assembly buildings, including all such equipment not specifically required by this Code, shall be maintained and operated so that, at all times, it will meet the requirements of this Code, and will not constitute a life or fire hazard.

CHAPTER 43

CLASS III, DWELLINGS

Sec. 430—General Requirements for Dwellings.
Sec. 431—Size and Construction of Dwellings.
Sec. 432—Exterior Requirements for Dwellings.
Sec. 433—Roof Requirements for Dwellings.
Sec. 434—Interior Arrangement of Dwellings.
Sec. 435—Exit Requirements for Dwellings.
Sec. 436—Other Interior Arrangements for Dwellings.
Sec. 437—Electrical and Mechanical Requirements for Dwellings.
Sec. 438—Existing Dwellings.
Sec. 439—Maintenance and Operation of Dwellings.

SECTION 430

GENERAL REQUIREMENTS FOR DWELLINGS

Scope of Dwellings

Par. 4300. Dwellings shall include every building or portion of a building designed, constructed or used as a private residence, dormitory, lodging house, convent, monastery, apartment house, apartment hotel, hotel, or as a place of similar habitation or abode.

References for Dwellings

Par. 4301. For applications, permits, certificates, inspections, violations, vacating, penalties and other administrative regulations, see part I.

Unusual Conditions in Dwellings

Par. 4307. In new or existing Dwellings, where unusual conditions not specifically regulated by this Code create a fire hazard or a health menace, the Buildings Engineer shall require such additional construction, equipment or facilities as may be necessary for the protection of life or health.

Density of Population in Dwellings

Par. 4308. The normal population of a Dwelling shall average not more than one person to each 80 square feet of the area of all floors in the building.

Converting into Dwellings

Par. 4309. No building of any other class of occupancy shall be converted into a Dwelling unless the building complies with all the requirements of this Code for new Dwellings.

SECTION 431

SIZE AND CONSTRUCTION OF DWELLINGS

General Construction Requirements for Dwellings

Par. 4310. The construction of Dwellings shall be in accordance with the type requirements in Part V and also with the requirements of this Section.

Height, Volume and Type Restrictions for Dwellings

Par. 4311. The height and volume of Dwellings shall be within the limits fixed by the following table, except as further restricted below:

TABLE 4311T

Type of building	Height		Maximum volume in cubic feet
	Feet	Stories	
Fireproof	Not hereby limited		Not hereby limited
Fire-resistant	100	10	1,200,000
Steel Frame	55	5	400,000
Slow Burning	55	5	250,000
Ordinary	45	4	175,000
Metal	35	3	100,000
Wood Frame	35	3	75,000

Dwellings shall be Type E, Ordinary, buildings or of a a higher type if they are constructed within 100 feet of a hazardous Commercial, Storage or Industrial building, unless the latter are Type A, Fireproof, buildings.

Where a Dwelling exceeds in volume the limits set in Table 4311T, it shall be divided into fire divisions by separations constructed as required in Sections 598 and 599, so that the volume of each such fire division will be within such limits.

Exceptions for Exterior Walls of Dwellings

Par. 4312. The following exceptions are permitted only for Type B, Fire-resistant, Type C, Steel Frame, buildings and for Type E, Ordinary, buildings with all structural members, floor and roof construction of incombustible materials, and when all such buildings are not over 3 stories or 35 feet in height, and not over 100,000 cubic feet in volume, and are used as Dwellings:

> The exterior walls of such buildings are not required to be in accordance with Paragraphs 5221, 5321 and 5521, but may be of incombustible materials protected against corrosion and constructed to have a three-hour fire-resistive rating for outside exposures and a two-hour rating for inside exposures, except where such walls are facing and within 3 feet of any adjoining property line or opposite alley line.

For special requirements of exterior walls bounding on courts, refer to Section 432.

Exceptions for Exterior Walls of Projections on Dwellings

Par. 4313. The exterior walls of bathrooms, kitchens, pantries, enclosed porches, conservatories and similar rooms at the first or second floor level projecting not over 10 feet from the exterior wall into the rear or side yard of a Dwelling, and constructed at least 18 inches from a property line, need not conform to the type requirements of the building, but may be constructed as required for the exterior walls for Type G, Wood Frame, buildings, except as follows:

a. Portions of such exterior walls and their supports located within 3 feet of any adjoining property line shall be of two-hour fire-resistive construction.

b. Portions of such exterior walls and their supports which are 3 feet or more, but less than 5 feet from any adjoining property line, shall be of one-hour fire-resistive construction.

c. Portions of such exterior walls and their supports which are 5 feet or more, but less than 10 feet from any adjoining property line shall be entirely covered on the outside with incombustible materials.

The exterior windows and doors on such projections shall be as required for the building. In the wall separating such projections from the building, only the necessary door and window openings shall be permitted.

Special Requirements for Floors in Dwellings

Par. 4314. In all Dwellings which are over four stories or 45 feet in height or over 150,000 cubic feet in volume, the floor immediately above any basement shall be of not lower than three-hour fire-resistive construction.

In all Dwellings which are over three stories or 35 feet in height or are over 75,000 cubic feet in volume, and not over four stories or 45 feet in height or 150,000 cubic feet in volume, the floor immediately above any basement shall be of not lower than two-hour fire-resistive construction.

In all Dwellings which are over two stories or 30 feet in height or over 40,000 cubic feet in volume and not over three stories or 35 feet in height or not over 75,000 cubic feet in volume, the floor immediately above any basement floor shall be of not lower than one-hour fire-resistive construction or be protected by a one-hour fire resistive ceiling placed directly under such floor over the basement.

In all Dwellings which are not over two stories or 30 feet in height, or 40,000 cubic feet in volume, no protection of floor immediately above any basement shall be required.

Exceptions for Exterior Openings in Dwellings

Par. 4316. Openings in exterior walls, facing an adjoining property line, of Dwellings less than 2000 square feet in area and not over 3 stories or 35 feet in height are not required to conform to the requirements in Part V, but shall never be placed less than 3 feet from such property lines.

Special Requirements for Exterior Openings in Dwellings

Par. 4319. The distance from any window or other opening in the exterior wall of a Dwelling, or unit, to any door, with an area exceeding 45 square feet, leading directly into a garage, or into a unit of hazardous Commercial, Storage or Industrial occupancy, any one or all of which exceeds 600 square feet in area, shall meet the following requirements:

a. Such distance above the top, or the level of the top for a distance of 5 feet beyond the sides, of said door shall be not less than 10 feet and such distance from any side of said door shall be not less than 5 feet.

b. When such distance above the top, or the level of the top for a distance of 10 feet beyond the sides, of said door is less than 20 feet and such distance from any side of said door is less than 10 feet, the said window or other opening shall be protected by a fixed fire-resistive window or a Class D fire door.

Whenever the distance from any said window or other opening to any door with an area of 45 square feet or less or any window or other opening in the exterior wall of a garage or a hazardous Commercial, Storage or Industrial building or unit is less than 5 feet at any side or less than 10 feet below the bottom of said window or other opening, the said window or other opening shall be protected by a fixed fire-resistive window or a Class D fire door.

SECTION 432

EXTERIOR REQUIREMENTS FOR DWELLINGS

Entrances to Dwellings

Par. 4321. Main entrances to Dwellings shall be at least equal in width to the required exits in which they are placed.

Projections from Dwellings

Par. 4322. Marquees, signs, footings and other similar projections, on or of every Dwelling, projecting beyond the building lines into a street or other public way shall be in accordance with Chapter 21.

General Requirements for Courts of Dwellings

Par. 4323. Courts serving windows required in Dwellings shall be open to the sky and no cornice, balcony, stairway, fire escape or other construction shall encroach upon the required area thereof. The height of a court shall be measured from the sill of the lowest required window which it serves. Courts shall be classified into through courts, outer courts and inner courts. The dimensions of rear and side yards serving required windows in Dwellings shall be not smaller than those hereinafter required for courts.

Through Courts of Dwellings

Par. 4324. The width of every through court serving required windows in Dwellings shall be not less than one-tenth of the length of such through court, except when the height of such through court exceeds forty feet the width thereof above the forty foot level shall be increased one-eighth of the excess height over and above forty feet. However, in no case shall the width of any such through court be less than six feet.

Outer Courts of Dwellings

Par. 4325. The width of every outer court serving required windows in Dwellings shall be not less than one-fourth of the length of such court, except when the height of such outer court exceeds forty feet the width thereof above the forty-foot level shall be increased one-eighth of the excess height over and above forty feet. However, in no case shall the width of any such outer court be less than six feet, except that for Dwellings not more than three stories in height such courts may extend across a property line if the width on either side thereof is not less than three feet, and provided further that the minimum required width of such courts shall not be reduced in width in any way on either side of the property line.

Inner Courts of Dwellings

Par. 4326. The width of every inner court serving required windows in Dwellings shall be of not less than one-half the length of such court, except when the height of such inner court exceeds 30 feet the width thereof above the thirty-foot level shall be increased one-eighth of the excess height over and above thirty feet. However, in no case shall the width of any such inner court be less than eight feet.

Measurements for Courts of Dwellings

Par. 4327. The length of all courts shall be measured along their center lines.

The length of a through court shall be the distance measured from one open end to the other open end of such court.

The length of an outer court shall be the distance measured from the closed end to the open end of such court. Where an outer court has two or more branches, the length shall be measured from the open end of such court to the end of each branch independently.

A branch, open at only one end, of a through court shall be considered to be a part of an outer court of length measured from the nearest open end of the through court to the closed end of the branch, in determining the width of such branch. Where a recess occurs at the closed end of an outer court the length of the court shall include the depth of the recess. An inner court between two sections of a through court may be disregarded in computing the length of the through court. Other arrangements of courts shall be measured for the purposes of Section 432 as determined by the Buildings Engineer so as to provide for every required window light and ventilation substantially as herein specified.

Recesses in Dwellings

Par. 4328. Required windows in Dwellings may front upon an open recess from the street, alley, park, court, yard or other open space from which they derive light and ventilation, provided the width of the recess is not less than 4 feet nor less than its horizontal depth. A recess from an inner court of width less than the required width of the court of which it is a part shall be disregarded in computing, for the purpose of Section 432, the dimensions of the court.

Property Lines as Court Boundaries of Dwellings

Par. 4329. The property line of a lot on which a Dwelling is to be erected, unless it is a common boundary between such lot and a street, alley, public park, cemetery, railroad right of way or other similar permanently open space, not less than 15 feet wide, shall be a boundary to an adjacent required court as though a wall without windows were erected on such line. If there is, appurtenant to such lot, an easement for light and air over a portion of an adjoining lot, in terms which assure that the easement will remain in force and effect so long as any windows require it for light and ventilation under the provisions of this Code, and duly recorded in the land records of Baltimore City, the portion subject to such easement may be considered to be part of such lot for the purposes of Section 432. No building or structure shall be erected in such manner as to reduce the light and ventilation in a building on the same lot subject to the provisions of Section 432 below the requirements thereof, nor shall a lot line be moved by sale of land or otherwise so as to permit such reduction by a building on an adjoining lot.

SECTION 433

ROOF REQUIREMENTS FOR DWELLINGS

Scuttles and Bulkheads on Dwellings

Par. 4335. Required scuttles in the roof of a Dwelling shall be in accordance with Paragraph 4353.

Skylights on Dwellings

Par. 4337. Skylights where used in Dwellings shall be constructed in accordance with Section 766.

Roof Drainage on Dwellings

Par. 4338. Roofs having parapet walls which will impound water shall be provided with scuppers not less than 8 by 12 inches, one for each 1000 square feet of roof, or fraction thereof. No scuppers shall be placed in any parapet wall which is facing and is less than 5 feet from any adjoining property line.

Gutters and Downspouts on Dwellings

Par. 4339. Gutters and leaders shall be provided on Dwellings to properly conduct the water from the roofs thereof where necessary to prevent damage to any property. Water from any part of a Dwelling building shall not be allowed to fall or flow on a public footway, except from window sills, copings and cornices, not more than one foot wide and from awnings or marquees discharging off the outer edge.

SECTION 434

INTERIOR ARRANGEMENT OF DWELLINGS

Scope of Interior Arrangements of Dwellings

Par. 4340. This Section includes the requirements for arranging and constructing the entrance lobbies, apartments, elevator lobbies, basements, furnace rooms, machinery rooms and toilet rooms, shafts, vertical openings and garages in Dwellings.

Entrance Lobbies in Dwellings

Par. 4341. Entrance lobbies or vestibules of every Dwelling shall be not less in width than the exit in which they are placed.

Heights of Rooms in Dwellings

Par. 4342. In Dwellings every room used for sleeping, living and eating, including kitchens, shall have a clear height of not less than 7 feet 6 inches, or at least 8 feet for not less than one-half its floor area, but for never less than 60 square feet. This provision does not apply to kitchenettes and breakfast nooks which are not enclosed and which do not have doors in openings for entrance thereto.

Apartments in Dwellings

Par. 4343. Every apartment in a Dwelling shall be entirely separated from every other apartment therein and each apartment shall have at least one entrance on a public hallway, or street, alley or other public way.

At least one living room in every Dwelling shall have a floor area of at least 160 square feet and the dimension of any such room measured parallel with the street line shall be not less than 13 feet including entrance lobbies, hallways, and alcoves, and in every apartment in a Dwelling there shall be at least one room which is not less than 120 square feet in floor area and the least dimension of such room shall be not less than 8 feet.

Living and Sleeping Rooms, Alcoves, Closets, Storerooms, and Kitchens: Refer to Paragraphs 4365 and 4366.

Elevator Lobbies in Dwellings

Par. 4344. Lobbies or other similar landing spaces for elevators permitted to be used as means of egress in all stories of Dwellings, except the first, shall have an aggregate area of not less than 2 per cent of the gross floor area served.

The width of exits from passenger elevator lobbies in the first story shall be not less than one foot for every 50 square feet, or major fraction thereof, of elevator car area discharging into the lobby. The width of such exits shall be added to the width of other exits which they may join.

Elevator lobbies shall be enclosed as required for passageways in Part V.

Basement Rooms in Dwellings

Par. 4345. No bedroom or living room resting upon the ground or in the basement of any building shall be permitted unless all of the following conditions are complied with:

1. The clear height shall be not less than 7 feet 6 inches.
2. The uppermost 3 feet of the required clear inner height shall be above the average outside ground level.
3. Windows shall be provided as required in Paragraph 4365.
4. The floor and walls shall be made water and damp proof by an approved method if in contact with earth. Such waterproofing shall be placed between the floor or wall finish and the ground.
5. Areas to provide for light or air for required windows shall be not less than 2 feet 6 inches wide.

No clubroom, private dining room, kitchen, toilet room, bathroom, or work room resting upon the ground or in the basement of any building shall be permitted unless the following conditions are complied with:

1. The clear height shall be not less than 7 feet.

2. At least one window or door shall be provided in opposite sides of such rooms to provide adequate ventilation and the area of such windows or doors on each side of such rooms shall be not less than one-twenty-fourth of the floor area of such rooms.

Furnace and Machinery Rooms in Dwellings

Par. 4346. In Dwellings more than 3 stories or 35 feet high or more than 75,000 cubic feet in volume, furnace rooms, power rooms and rooms for fuel storage shall be separated from the rest of the building including all stairways by at least a two-hour fire-resistive construction, and all openings therein shall be protected by self-closing Class B fire doors or fixed fire-resistive windows.

No such rooms in such Dwellings shall open directly into any stairway or other required exit from the building or be located under such exits.

In other Dwellings, such fire-resistive separation need not be provided, but any combustible construction over the fuel space, except domestic heating plants serving not over 1400 square feet of radiation, shall be protected with metal lath and plaster or covered with asbestos board.

The space around heating boilers and furnaces shall be protected as required in Chapters 93 and 94. Furnaces and fuel storage spaces in such Dwellings shall not be located directly under any stairs or exits.

For required machinery rooms of refrigerating systems, refer to Chapter 96.

Bathrooms and Toilet Rooms in Dwellings

Par. 4347. Every Dwelling and every apartment containing more than two rooms shall have at least one bathroom.

There shall be at least one bathroom or one toilet room in each story of a Dwelling which is more than 3 stories or 35 feet high or more than 2000 square feet in area, where there is a sleeping room in the same story without direct access to such facilities. Such bathrooms or toilet rooms shall be located not more than 75 feet from such sleeping rooms. Where separate toilet rooms are provided for each sex, they shall be clearly marked "MEN" or "WOMEN". No toilet room or bathroom shall connect directly with any kitchen, dining or other room where food is prepared or served.

In every room containing a water closet, there shall be a window opening onto a street or other public way or onto a yard or court not less than three feet wide on the same lot as the Dwelling in which said water closet is located, except in Dwellings where the installation of such windows is impracticable. In such cases where windows are impracticable, a proper automatically operated ventilating system shall be installed, except that in dwellings two stories or less in height and not over 2000 square feet in area, a ventilating duct having an area of at least 32 square inches shall be permitted.

Every room or compartment containing a water closet shall be not less than 33 inches wide, and there shall be a clear space at least 18 inches wide directly in front of the water closet.

All floors in toilet rooms, except in private residences, shall have a waterproof non-absorbent finish. Walls and ceilings of all toilet rooms shall be smoothly finished.

Separate compartments shall be provided for each water closet where more than one water closet or a water closet and a urinal or urinals are placed in the same toilet room or bathroom.

Shafts and Vertical Openings in Dwellings

Par. 4348. In Dwellings more than 3 stories or 35 feet high, or over 75,000 cubic feet in volume, all shafts shall be enclosed in all stories.

Single openings in floors of such Dwellings shall be enclosed either in the story above or below, except as follows:

a. All stairways piercing only one floor above the first floor, serving as required exits from one story, shall be enclosed in the other story, except that one such stairway leading only from the first to the second story need not be enclosed.

b. All stairways not in required exits piercing only one floor above the first need not be enclosed.

c. Stairways leading only from the first floor to lounges, restaurants and similar public rooms in the basement need not be enclosed. All other stairways leading to the basement shall be enclosed in the basement.

In all other Dwellings, all shafts, except stairways, shall be enclosed.

These regulations shall not be held to require the enclosure of mezzanine floors nor of shafts or single openings in such floors only.

All enclosures shall be in accordance with the type requirements in Part V.

Garages and Other Hazardous Occupancies in Dwellings

Par. 4349. Garages more than 600 square feet in area or more than one story in height, and other units of hazardous Commercial, Storage or Industrial occupancy in or attached to Dwellings, shall be constructed in all parts as required for Type A, Fireproof, buildings and separated from the Dwellings as required in Section 407. Openings permitted in such separations shall be provided with a vestibule not less than 10 feet long and of not lower than three-hour fire-resistive construction with a self-closing Class A fire door in each end of such vestibule. The floor of such vestibule shall be at least two feet above the garage floor.

One-story garages 600 square feet or less in area, including all other spaces accessible to motor vehicles, in or under every Dwelling, shall be in all their parts of not lower construction than that required for Type D, Slow-Burning, buildings. Such garages shall be separated from the Dwelling by not lower than two-hour fire-resistive construction. Only one opening, not over 25 square feet in area, shall be permitted in such operation. The sill of such opening shall be at least 2 feet above the garage floor, and the opening shall be protected by a self-closing Class A fire door. Exterior openings serving such garages shall meet the requirements of Paragraph 4716 for larger garages.

One story garages 600 square feet or less in area attached to a Dwelling, except a Dwelling of Type G, shall be separated from the Dwelling by not lower than two-hour fire-resistive construction. The roof of such attached garage shall be protected by a ceiling of one-hour fire-resistive construction and the exterior walls of such garage shall have a one-hour fire-resistive rating on inside exposure. No garages shall be attached to Type G buildings, unless such garages are Type A or Type B buildings.

SECTION 435

EXIT REQUIREMENTS FOR DWELLINGS

General Exit Requirements for Dwellings

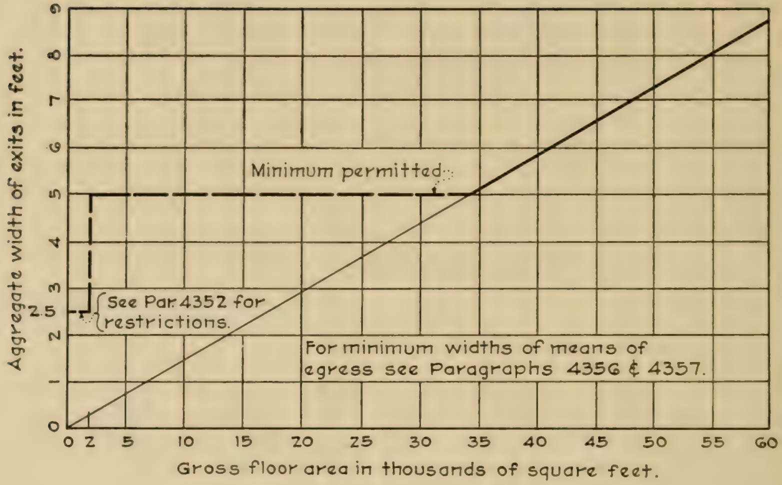
Par. 4350. Every Dwelling shall be provided with safe exits, in accordance with the requirements of this Section. When unusually hazardous conditions or conditions not covered by this Code exist in any Dwelling the Buildings Engineer shall order additional exit facilities to assure the safety of the occupants.

Mezzanine floor areas in a Dwelling discharging on a floor shall be added to the area of that floor.

Width of Exits from Floor Areas of Dwellings

Par. 4351. The aggregate width of exits from every floor area above the basement in Dwellings shall not be less than that shown graphically on the following diagram. The width of each exit shall be not less than the total required width divided by the number of exits, but never less than 30 inches, except where otherwise specifically permitted.

DIAGRAM 4351D



The required width of exits shall not be reduced in the direction of exit travel.

The exits from one story shall be permitted to be joined with the exits from the story immediately above without adding the width of such exits, but the number of exits, as required in the following paragraphs, shall not be reduced.

Location and Number of Exits from Stories in Dwellings

Par. 4352. Every story or fire division thereof above the basement in Dwellings shall have at least two exits separated and as remote as possible from each other, except as may otherwise be permitted in this Code, and all such exits shall be accessible at all times to each and every occupant of such story or fire division. The location and number of exits shall be such that the shortest distance a person must travel from the entrance doorway of a room, suite of rooms or apartment, to reach an exit from the story or fire division in the various types of buildings shall not exceed that given in Column 1 of Table 4352T.

Where such entrance doorways are in a dead end corridor, passageway, hallway or other location which is open at only one end, the greatest distance a person must travel from such doorway to reach a point from which two or more exits may be reached in basically opposite directions shall not exceed that given in Column 2 of Table 4352T.

TABLE 4352T

Type of building	Column 1	Column 2
Fireproof	150 feet	30 feet
Fire-resistant	100 “	25 “
Steel Frame	75 “	20 “
Slow Burning	75 “	20 “
Ordinary	50 “	15 “
Metal	50 “	15 “
Wood Frame	30 “	10 “

In cases where the minimum aggregate width of exits as required by Paragraph 4351 is not sufficient to provide the number of exits needed to satisfy the requirements of this Paragraph for maximum distance of travel to them, additional exits shall be provided and they shall be distributed as uniformly as possible. Not more than one-half of the required exits shall lead into the same lobby, or passageway, after leaving the floor.

Stories or fire divisions in Dwellings less than 200 square feet in area are not required to have more than one exit in the following types of buildings:

(a) In Type A, Fireproof, or Type B, Fire-resistant, buildings not over 10 stories or 100 feet in height.

(b) In Type C, Steel frame, or Type D, Slow Burning buildings not over three stories or 35 feet in height.

(c) In Type E, Ordinary, Type F, Metal, or Type G, Wood Frame, buildings, not over two stories or 30 feet in height.

In stories with one exit, the distance a person must travel from any corridor entrance door of rooms, suites or apartments to an exit from that story shall not exceed the distance given in Column 2 of Table 4352T.

Every occupant of a story shall at all times have access to at least two remote exits from the story, except as follows:

a. In stories or fire divisions thereof required to have only one exit.

b. In buildings not over 3 stories in height with apartments enclosed by walls and floors of two-hour fire-resistive rating and each apartment provided with a direct exit to the street.

Roof Exits in Dwellings

Par. 4353. A flat roof intended to be occupied by persons shall be considered a room and a story, and exits shall be provided accordingly.

Access to flat roofs, on Dwellings ordinarily not occupied, shall be provided with exits as follows:

a. From top stories 2000 square feet or less in area, one stairway not less than 24 inches wide, or a scuttle not less than 2 feet by 3 feet.

b. From top stories more than 2000 square feet, but not over 6000 square feet in area, one stairway not less than 24 inches wide and another such stairway or a ladder remote from the first stairway.

c. From top stories over 6000 square feet in area, the two most remote stairways of the building shall be extended to the roof to form an exit not less than 24 inches wide.

Basement Exits in Dwellings

Par. 4354. The exits from all basements, cellars, or fire divisions thereof, in Dwellings, shall be not less than 30 inches wide and at least one exit shall lead directly to a street or an open space leading to a street. Such areas shall have at least two exits, as remote as possible from each other, in the following cases:

a. Where they are more than 1000 square feet in area.

b. Where they contain apartments, suites or rooms used for dwelling purposes. The exits in such cases shall be in accordance with Paragraphs 4351 and 4352.

Where two exits are required by Paragraph 4355 from furnace and power rooms which are located in the basement, at least one such exit shall lead directly to a street or to an open space leading to a street.

Every occupant of a basement shall at all times have access to at least two remote exits, except where only one exit is required.

Room Exits in Dwellings

Par. 4355. The exits from every room, apartment or suite in Dwellings shall be at least 30 inches wide. No point in such areas shall be more than 60 feet, measured along a travel path, from an exit therefrom.

Every room, apartment or suite, except as noted below, with an aggregate area of more than 2000 square feet, and every kitchen serving a public dining room, shall have at least two exits as remote from each other as possible.

Furnace rooms and power rooms shall have not less than two remote exits if they are more than 1600 square feet in area.

Storage and work rooms more than 1000 square feet in area shall have not less than two remote exits.

Exits from apartments, suites or separate rooms which are not in apartments or suites shall not lead through other apartments, suites or rooms, except that one exit from an apartment, suite, or separate room having two or more exits may lead through one other apartment, suite, or separate room having the required exits, if the area of both said apartments, suites, or separate rooms, or any combination of them, does not exceed 2000 square feet.

Required Means of Egress in Dwellings

Par. 4356. The required exits in Dwellings shall consist of one or more doorways, passageways, interior stairways, fire towers or ramps, or any combination of them, constructed in accordance with Chapters 76 and 77. Such means of egress shall be as follows:

Doorways: The clear width of a single doorway or the aggregate clear width of a multiple doorway shall not be less than the required width of the exit in which it is placed.

Passageways: The clear width of a passageway shall not be less than the required width of the exit in which it is placed.

Interior Stairways and Fire Towers: The width of such stairways, as defined in Paragraph 7722, in exits leading from each story or parts thereof, used as Dwellings, shall not be less than three and one-third times the required width of such exits, as determined from the solid line in Diagram 4351D, but never less than 30 inches.

The width of such stairways in exits leading from roofs, basements and other stories, or parts thereof, used for service or similar purposes only, shall be at least equal to the width of such exits.

No stairway serving upper stories of Dwellings over 3 stories or 35 feet in height, or over 75,000 cubic feet in volume, shall be continued below the first floor level, unless they are enclosed in the basement and discharge into an enclosed means of egress leading directly to the street from the basement.

Ramps shall comply with all the requirements for stairways that are applicable.

Conditional Means of Egress in Dwellings

Par. 4357. Conditional means of egress constructed in accordance with Chapters 76 and 77 shall be permitted only to provide additional exits in existing Dwellings with inadequate exits, or where, in such Dwellings hereafter erected, it is unreasonable or impracticable to construct required means of egress, but only upon the approval of the Buildings Engineer. Such means of egress shall be as follows:

Horizontal Exits: The clear width of each means of egress forming a horizontal exit shall be at least equal to that of the required exit in which it is placed. There shall be one or more exits leading directly to a street, from a story or fire division on each end of a horizontal exit, the aggregate width of which shall be at least equal to the width of the horizontal exit. The areas on each end of a horizontal exit shall be occupied by the same tenant, or unobstructed paths leading to the exits shall be continuously available to the different tenants of such areas.

Exterior Stairways: The width of exterior stairways shall be as required for interior stairways.

Such stairways shall be permitted only where at least two required means of egress remote from each other are available from the story. Open exterior stairways shall not be permitted on buildings over 7 stories or 75 feet high.

Exterior Ramps shall comply with all the requirements for exterior stairways that are aplicable.

Moving Stairs or Escalators of the horizontal tread type which operate normally in the direction of exit travel may be substituted for an equal width of stairway or ramp but for not more than 25 per cent of the required width of exits from the area served. Escalators shall not be less than 30 inches wide.

Passenger Elevators may be given credit as exits by considering each unit of capacity of 35 persons per minute, from the highest loading area, equivalent to one foot of required exit width as determined from the solid line in Diagram 4351D, but not more than 33-1/3 per cent of such required exit width shall be substituted by elevators.

Standard Steel Fire Escapes may be permitted only on existing buildings or on buildings hereafter erected which are not over 3 stories or 35 feet high.

Revolving Doors may be permitted at the rate of one revolving door to one foot of required exit width, as determined from the diagram in Paragraph 4351, except that Type B doors, as defined in Paragraph 7640, shall not be permitted to constitute more than 50 per cent of the width of each exit. Revolving doors shall not be placed within 10 feet of the foot of any stairway.

Ladders may be permitted only in exits from furnace and machinery rooms in basements, and for access to roofs.

Emergency Means of Egress in Dwellings

Par. 4358. In existing Dwellings, except in private residences, where additional exits are required under the conditions stated in Paragraph 4350, and it is unreasonable or impracticable to construct required or conditional means of egress, emergency means of egress may be permitted or ordered by the Buildings Engineer.

Such means of egress are windows, sliding chutes, poles, ladders in locations other than those permitted in Paragraph 4357, and spiral stairs.

Exit Signs in Dwellings

Par. 4359. All exits from stories in Dwellings, except from Dwellings having less than 5 apartments or ten bedrooms shall be indicated by suitable signs at all times when the building is occupied. Where exit signs are not visible from every corridor entrance door, directional signs indicating the exits shall be provided. Directional signs shall also be placed along the lines of exits.

For the requirements of exit and directional signs, refer to Paragraph 7892.

SECTION 436

OTHER INTERIOR ARRANGEMENTS FOR DWELLINGS

Scope of Other Interior Arrangements for Dwellings

Par. 4360. This Section includes all requirements for public dining rooms, kitchens and special service rooms in dwellings.

Public Dining Rooms in Dwellings

Par. 4364. Public dining rooms, or a group of such rooms, over 2500 square feet in area, in a Dwelling shall be separated from other portions of the Dwelling, as required in Paragraph 4078 for light hazardous commercial occupancies.

Living and Sleeping Rooms in Dwellings

Par. 4365. No room used for living or sleeping purposes in Dwellings shall have a floor area of less than 60 square feet with a minimum width of 6 feet.

Sleeping rooms shall have windows in exterior walls with an aggregate area of not less than one-eighth of the floor area, nor less than 11 square feet. At least one-half of the required window area shall be arranged to open. Every such window shall front upon a street, alley at least 10 feet wide, or other permanent open space at least 15 feet wide, or upon a yard or court as regulated in Paragraphs 4323 to 4329, inclusive.

Alcoves: Alcoves in apartments satisfying the following requirements shall not be required to contain separate exits and windows. The area shall not exceed 25 per cent of the adjoining room area and the depth shall not exceed 50 per cent of the width. The opening between the alcove and the room shall be at least 7 feet high and not less in area than 50 per cent of the alcove floor area, but never less than 60 square feet. Alcoves not meeting these requirements shall be considered separate rooms.

Closets: Spaces, except kitchens, bathrooms, toilets, pantries, and similar accessory rooms, less than 60 square feet in area, in apartments, shall be considered closets.

In hotels and apartment houses no closet or storage space shall open into any stairwell or stairs in a Type A, Fireproof, and Type B, Fire-resistant, building, or shall be placed in, under, or adjacent to any stairwell or stairs in all other types of buildings.

Kitchens in Dwellings

Par. 4366. Kitchens serving public dining rooms over 2000 square feet in area in Dwellings shall be separated from such dining rooms and the other portions of the building by not lower than two-hour fire-resistive construction, with all openings therein protected by self-closing Class C fire doors.

Kitchens serving public dining rooms 2000 square feet or less in area in Dwellings shall be separated therefrom by not lower than one-hour fire-resistive construction, with all openings therein protected by self-closing doors.

Special Service Rooms in Dwellings

Par. 4367. Laundries in Dwellings over 3 stories or 35 feet in height, or 100,000 cubic feet in volume, shall be located in the basement or in the top story, unless separated from the rest of the building by three-hour fire-resistive walls and floors, with all openings therein protected by Class C fire doors.

Dressing and locker rooms where provided in Dwellings shall have adequate floor space for each person to be accommodated, but in no case shall a dressing room be less than 30 square feet in area. There shall be separate dressing rooms for men and women.

Stores in Dwellings

Par. 4368. In Dwellings, light and moderately hazardous shops and stores having an area less than 2000 square feet and less than 15 per cent of the floor area in the story, except tobacco, newspaper, magazine and confectionery stands not over 5000 square feet in area, shall be separated from the other portions of the buildings by not less than one-hour fire-resistive construction. Hazardous stores and shops shall be separated as required in Section 407 for hazardous commercial occupancies.

SECTION 437

ELECTRICAL AND MECHANICAL REQUIREMENTS FOR DWELLINGS

Scope of Electrical and Mechanical Requirements in Dwellings

Par. 4370. This Section includes the requirements for fire extinguishing appliances, heating and ventilation, fire alarm, lighting, plumbing and other electrical and mechanical equipment for Dwellings.

Fire Extinguishing Appliances in Dwellings

Par. 4371. Automatic Class A sprinklers shall be installed in laundries, furnace rooms and power rooms, workrooms, storage rooms, kitchens other than in apartments, and in all basements not used for apartments, of every Dwelling over 7 stories or 75 feet in height, or over 500,000 cubic feet in volume.

Every Dwelling 4 stories or 50 feet or less in height, except Dwellings with less than 4 apartments, or accommodating less than 15 persons, shall be equipped with portable fire extinguishers or a First Aid standpipe system; Dwellings more than 4 stories or 50 feet but less than 75 feet in height, shall be equipped with either a First Aid standpipe system or with a Fire Department standpipe system and portable fire extinguishers; and Dwellings 75 feet or more in height shall be equipped either with a Standard standpipe system or with a Fire Department standpipe system and portable fire extinguishers.

Where standpipes are provided, the number of hose stations in each building or fire division thereof shall be such that 75 feet of hose will reach within 20 feet of all points in each story of the building.

In the First Fire Zone, in Dwellings more than 75 feet high, all standpipes shall be extended above the roof and equipped with a hose outlet.

Where portable fire extinguishers are provided, there shall be at least one two-and-one-half gallon Class A extinguisher in each story and basement in each 3000 square feet of floor area or fraction thereof.

Fire Alarms in Dwellings

Par. 4373. In every Dwelling which is more than 3 stories in height or which contains more than 4 bedrooms or 2 apartments above the second story, except in a private residence, a Class I or Class II fire alarm system shall be installed in accordance with Section 895.

In addition to the required sending stations, at least one approved automatic detector which will sound the alarm in case of fire shall be placed in the following locations: (1) at the ceiling in front of furnaces, (2) at the ceiling over fuel storage spaces, (3) at the head of all stairs from the basements, (4) in the ceiling of every kitchen serving more than 25 persons, (5) in every room for the storage of combustible material, and (6) near any source of great fire hazard.

Heating and Ventilation in Dwellings

Par. 4375. Every Dwelling shall be provided with a heating system capable of maintaining a temperature of at least 70 degrees Fahrenheit when the outside temperature is zero, in sleeping, dining and living rooms, bath and toilet rooms, dressing and locker rooms, lobbies, operating offices and hallways.

All rooms and other portions of such Dwelling, except sleeping rooms, shall be equipped with a mechanical or gravity ventilating system capable of furnishing one cubic foot of fresh air for every 10 square feet of floor area or provided with windows or skylights with an aggregate open area of at least one-sixteenth the floor area, except that in toilet and bath rooms, private kitchens 70 square feet or less in area, furnace rooms and similar rooms not normally occupied, such windows shall have an aggregate open area of at least one-twentieth the floor area. For required windows in the sleeping rooms, refer to Paragraph 4365.

Lighting in Dwellings

Par. 4376. Dwellings shall be provided with means of artificial illumination of at least the following intensities at the floor level in the locations stated:

a. In all rooms used for living, sleeping and eating purposes	10 foot-candles
b. In corridors, passageways, stairways and exits, toilet and service rooms	3 foot-candles
c. In public dining rooms and all kitchens	8 foot-candles
d. All other portions used by human beings	5 foot-candles

Electrical Equipment in Dwellings

Par. 4377. The construction and installation of all electrical appliances, equipment and wiring in Dwellings shall comply with the requirements of Part VIII.

Plumbing Requirements in Dwellings

Par. 4378. Every one apartment Dwelling and every apartment in other Dwellings, shall be provided with a separate lavatory, sink with running water, water closet and bathtub or shower.

In hotels and lodging houses one water closet and one lavatory shall be provided for every 2000 square feet or fraction thereof of room area without access to such facilities.

No water closet or urinal shall be installed in any sleeping or living room.

At least one sanitary drinking fountain shall be provided in the lobby of every hotel.

In hotels and lodging houses one bathtub or shower shall be provided for every 4000 square feet of room area not having access to such facilities.

SECTION 438

EXISTING DWELLINGS

General Requirements for Existing Dwellings

Par. 4380. Dwellings existing at the time this Code is adopted shall be permitted to continue if the requirements of Section 438 are complied with.

Non-Conforming Construction of Dwellings

Par. 4381. When a Dwelling, whose type or construction is not in conformity with the provisions of this Code, is altered or reconstructed in such a manner that the type or construction thereof is affected, any and all parts of such Dwelling affected by the alteration or reconstruction shall be made to conform to all of the requirements of this Code for type and construction of new Dwellings, or as near thereto as the Buildings Engineer may deem reasonable. Repairs on such Dwellings are permitted without conforming to this Code.

Non-Conforming Arrangements of Dwellings

Par. 4382. Non-conforming interior arrangements of existing Dwellings shall be permitted to continue if they do not create a hazard to life. Whenever such interior arrangements are altered, the new arrangements shall conform as nearly as possible to those required for new buildings, but in any case, the alterations shall create better or safer conditions.

Non-Conforming Heating Plants in Dwellings

Par. 4383. Non-conforming heating plants in Dwellings shall be made to conform to the requirements for new buildings upon notice from the Buildings Engineer, if they constitute a menace to the public safety or general welfare.

Non-Conforming Arrangement of Dwellings

Par. 4384. Where, in an existing Dwelling, the interior arrangement is not in conformity with the provisions of this Code, it shall be made to conform to the requirements of this Code for the interior arrangement in a new Dwelling, if such non-conforming arrangement constitutes an imminent hazard to life or property.

However, when a Dwelling is altered or reconstructed in such a manner that the interior arrangement thereof is changed, the new arrangement shall be made to conform as nearly as possible to the requirements of this Code for the interior arrangement in a new Dwelling.

Non-Conforming Exits in Dwellings

Par. 4385. Where, in an existing Dwelling, the exits or means of egress are not in conformity with the provisions of this Code, they shall be made to conform to the requirements of this Code for exits and means of egress in new Dwellings, if such non-conforming exits or means of egress are a hazard to life.

However, when a Dwelling is altered or reconstructed in such a manner that the exits or means of egress therein are affected, or the means of egress therein are renewed or altered, all such exits or such means of egress shall be made to conform to the requirements of this Code for exits and means of egress in new Dwellings.

Non-Conforming Fire Protection in Dwellings

Par. 4386. Where standpipe systems are not installed in existing Dwellings but are required by this Code, standpipes shall be installed as required or a two-and-one-half gallon portable Class A fire extinguisher shall be conveniently located in every place where a hose station is required.

Where sprinkler systems are not installed in such buildings, but are required by this Code, sprinklers shall be installed upon notice from the Buildings Engineer where and as requested jointly by the Board of Fire Commissioners and the Buildings Engineer.

In all other respects, fire protection shall be made to conform to the requirements of this Code.

Non-Conforming Electrical and Mechanical Equipment in Dwellings

Par. 4387. Where, in an existing Dwelling, the electrical and mechanical equipment does not conform to the provisions of Part IV of this Code, such equipment shall be made to conform, except as hereinafter provided, to the requirements of Part IV of this Code for the electrical and mechanical equipment of new Dwellings, if such non-conforming equipment or the absence of such equipment constitutes an imminent menace to life or health.

However, when such non-conforming electrical and mechanical equipment is altered, any and all parts of such equipment affected by the alteration, shall be made to conform to the requirements of this Code for electrical and mechanical equipment in new Dwellings.

Non-Conforming Plumbing in Dwellings

Par. 4388. Plumbing in existing Dwellings not in accordance with the requirements of this Code shall be made to conform, upon notice from the Buildings Engineer, if they constitute a menace to the public safety or general welfare.

SECTION 439

MAINTENANCE AND OPERATION OF DWELLINGS

Scope of Maintenance and Operation of Dwellings

Par. 4390. The requirements of this Section for maintenance and operation of Dwellings shall apply to every Dwelling.

General Maintenance of Dwellings

Par. 4391. Every Dwelling and all parts thereof shall be kept in good repair and in a safe condition while in use, or any other time when the lack of maintenance affects adjoining property; the roof and walls shall be kept so as not to leak; and all means of draining rain water therefrom shall be kept so as not to cause dampness in the walls, ceilings, or basements.

All devices or safeguards which are required by this Code when the buildings are erected, altered or repaired shall be maintained in good working order.

All self-closing fire doors shall be kept normallly closed. Automatic fire doors and their operating devices shall at all times be maintained in working order.

Exits, and other means of escape when permitted, shall be maintained at all times in good, safe, usable condition.

The enforcement of all fire prevention regulations shall be by the Fire Department.

The enforcement of all sanitary regulations shall be by the Health Department.

General Operation of Dwellings

Par. 4392. The operation of Dwellings shall be under the supervision of the Fire Department and the Health Department.

Maintenance and Operation of Fire Protection in Dwellings

Par. 4394. The maintenance and operation of fire extinguishing appliances and equipment in Dwellings shall be under the supervision of the Fire Department, who shall also enforce all regulations pertaining thereto. Refer to Chapter 98.

Maintenance and Operation of Heating and Ventilation in Dwellings

Par. 4395. Refer to Part IX for regulations governing the maintenance of heating and ventilating equipment in Dwellings. The operation of such equipment shall be under the supervision of the Health Department, who shall also enforce all regulations pertaining theerto.

Maintenance and Operation of Plumbing in Dwellings

Par. 4396. The maintenance and operation of plumbing in Dwellings shall be under the supervision of the Health Department, who shall also enforce all regulations pertaining thereto.

Maintenance and Operation of Other Electrical and Mechanical Equipment in Dwellings

Par. 4397. All other electrical and mechanical equipment in Dwellings, including all such equipment not specifically required by this Code, shall be maintained and operated so that, at all times, it will meet the requirements of this Code and will not constitute a life or fire hazard.

CHAPTER 44

CLASS IV, INSTITUTIONS

Sec. 440—General Requirements for Institutions.
Sec. 441—Size and Construction of Institutions.
Sec. 442—Exterior Requirements for Institutions.
Sec. 443—Roof Requirements for Institutions.
Sec. 444—Interior Arrangement of Institutions.
Sec. 445—Exit Requirements for Institutions.
Sec. 446—Other Interior Arrangements for Institutions.
Sec. 447—Electrical and Mechanical Requirements for Institutions.
Sec. 448—Existing Institutions.
Sec. 449—Maintenance and Operation of Institutions.

SECTION 440

GENERAL REQUIREMENTS FOR INSTITUTIONS

Scope of Institutions

Par. 4400. Institutions shall include every building or portion of a building, designed, constructed or used as a hospital, sanitarium, insane asylum, orphanage, infirmary, home for the aged, reformatory, jail, prison, or as a place of detention, for 10 or more persons. When Institutions accommodate less than 10 persons, they shall be classed as Dwellings.

References for Institutions

Par. 4401. For applications, permits, certificates, inspections, violations, vacating, penalties and other administrative regulations, see Part I.

Unusual Conditions in Institutions

Par. 4407. In new or existing institutions, where unusual conditions not specifically regulated by this Code create a fire hazard or a health menace, the Buildings Engineer shall require such additional construction, equipment or facilities as may be necessary for the protection of life or health.

Density of Population in Institutions

Par. 4408. The normal population of an Institution shall average not more than one person to each 100 square feet of the area of all floors in the building.

Converting into Institutions

Par. 4409. No building of any other class of occupancy shall be converted into an Institution unless the building complies with all the requirements of this Code for new Institutions.

SECTION 441

SIZE AND CONSTRUCTION OF INSTITUTIONS

General Construction Requirements for Institutions

Par. 4410. The construction of Institutions shall be in accordance with the type requirements in Part V and also with the requirements of this Section.

Height, Volume and Type Restrictions for Institutions

Par. 4411. The height and volume of every Institution shall be within the limits fixed by the following table, except as further restricted below:

TABLE 4411T

Type of building	Height		Maximum volume in cubic feet
	Feet	Stories	
Fireproof	Not hereby limited		Not hereby limited
Fire-resistant	75	7	1,200,000
Steel Frame	45	4	300,000
Slow Burning	40	3	250,000
Ordinary	40	3	100,000
Metal	30	2	100,000
Wood Frame	25	1	50,000

Jails, prisons, reformatories, houses of correction, asylums for insane and feeble-minded, and parts of police stations where persons are involuntarily detained, shall be in Type A, Fireproof, buildings.

Other institutions shall be Type A, Fireproof, or Type B, Fire-resistant, buildings if they are constructed within 100 feet of a hazardous Commercial, Storage or Industrial building, unless the latter are Type A, Fireproof, buildings, or of a filling station, pump or tank where inflammable liquids are stored or handled.

Where an Institution exceeds in volume the limits set in Table 4411T, it shall be divided into fire divisions by separations constructed as required in Seitions 598 and 599, so that the volume of each such fire division will be within such limits.

Exceptions for Exterior Walls of Institutions

Par. 4412. The following exceptions are permitted only for Type B, Fire-resistant, Type C, Steel Frame, buildings and for Type E, Ordinary, buildings, will all structural members, floor and roof construction of incombustible materials, and where all such buildings are not over 3 stories or 35 feet in height, and not over 100,000 cubic feet in volume, and are used as Institutions:

The exterior walls of such buildings are not required to be in accordance with Paragraphs 5221, 5321 and 5521, but may be of incombustible materials protected against corrosion constructed to have a three-hour fire-resistive rating for outside exposures and a two-hour rating for inside exposures, except where such walls are facing and within 3 feet of any adjoining property line or opposite street line.

Special Requirements for Interior Walls in Institutions

Par. 4413. Interior walls and partitions in hospitals, sanitariums, orphanages, nurseries, homes for the aged and similar institutions more than one story or 25 feet in height shall be of not lower than one-hour fire-resistive construction.

Special Requirements for Floors in Institutions

Par. 4414. Floors of hospitals, sanitariums, orphanages, nurseries, homes for the aged and similar institutions more than one story or 25 feet in height shall be of not less than one-hour fire-resistive construction, and the first floor of such buildings more than two stories or 30 feet in height shall be as required in Type A, Fireproof, or Type B, Fire-resistant, buildings.

Prison Cell Construction in Institutions

Par. 4416. The provisions of this Chapter and of Chapters 51 and 52 shall not be held to prohibit cell block mezzanine floor construction of unprotected metal without limitation as to number and area of such floors, provided the construction of the entire cell block is of incombustible material.

Special Requirements for Exterior Openings in Institutions

Par. 4419. The distance from any window or other opening in the exterior wall of an Institution, or unit, to any door, with an area exceeding 45 square feet, leading directly into a garage, or into a unit of hazardous Commercial, Storage or Industrial occupancy, shall meet the following requirements:

a. Such distance above the top, or the level of the top for a distance of 5 feet beyond the sides, of said door shall be not less than 10 feet and such distance from any side of said door shall be not less than 5 feet.

b. When such distance above the top, or the level of the top for a distance of 10 feet beyond the sides, of said door is less than 20 feet and such distance from any side of said door is less than 10 feet, the said window or other opening shall be protected by a fixed fire-resistive window or a Class D fire door.

Whenever the distance from any said window or other opening to any door with an area of 45 square feet or less or any window or other opening in the exterior wall of a garage or a hazardous Commercial, Storage or Industrial building or unit is less than 5 feet at any side or less than 10 feet below the bottom of said window or other opening, the said window or other opening shall be protected by a fixed fire-resistive window or a Class D fire door.

SECTION 442

EXTERIOR REQUIREMENTS FOR INSTITUTIONS

Entrances To Institutions

Par. 4421. Main entrance to Institutions shall be at least equal in width to the required exits in which they are placed, but no entrance doorway shall be less than 4 feet wide.

Projections From Institutions

Par. 4422. Marquees, cornices, signs, footings and other similar projections, on or of every Institution projecting beyond the building lines into a street or other public way shall be in accordance with Chapter 21.

Courts in Institutions

Par. 4423. Where required windows in Institutions open on courts, the courts shall be in accordance with Paragraphs 4323 to 4329 inclusive, courts in Dwellings.

SECTION 443

ROOF REQUIREMENTS FOR INSTITUTIONS

Scuttles and Bulkheads On Institutions

Par. 4435. Required scuttles in the roof of an Institution shall be in accordance with Paragraph 4453.

Skylights On Institutions

Par. 4437. Skylights, where used in Institutions, shall be constructed in accordance with Section 766.

Roof Drainage On Institutions

Par. 4438. The roof surface of every Institution shall be arranged so as to drain directly to gutters or leaders. Roofs having parapet walls which will impound water shall be provided with scuppers not less than 8 by 12 inches, one for each 1000 square feet of roof, or fraction thereof. No scuppers shall be placed in any parapet wall which is facing and is less than 5 feet from any adjoining property line.

Gutters and Downspouts On Institutions

Par. 4439. Gutters and leaders shall be provided on Institutions to properly conduct the water from the roofs thereof where necessary to prevent damage to any property. Water from any part of a building, shall not be allowed to fall or flow on a public footway, except from window sills, coping and cornices, not more than one foot wide and from awnings or marquees discharging off the outer edge.

SECTION 444

INTERIOR ARRANGEMENT OF INSTITUTIONS

Scope of Interior Arrangements of Institutions

Par. 4440. This Section includes the requirements for arranging and constructing the entrance and elevator lobbies, basements, furnace rooms, machinery rooms and toilet rooms, shafts, vertical openings, garages and the subdivision of upper floors in Institutions.

Entrance Lobbies In Institutions

Par. 4441. Entrance lobbies or vestibules of every Institution shall be not less in width than the exit in which they are placed.

Heights of Rooms in Institutions

Par. 4442. Every room used for living, sleeping and eating, including kitchens in an Institution, shall have a clear height of at least 8 feet for not less than one-half its floor area, but for never less than 60 square feet.

Subdivisions of Upper Floors in Institutions

Par. 4443. The floors above the first story in Institutions shall be subdivided into area not exceeding 20,000 square feet by at least two-hour, fire-resistive construction with all openings therein protected by Class B fire doors or fixed fire-resistive windows.

Elevator Lobbies in Institutions

Par. 4444. Lobbies or other similar landing spaces for elevators permitted to be used as means of egress in all stories of Institutions, except the first, shall have an aggregate area of not less than 2 per cent of the gross floor area served.

The width of exits from passenger elevator lobbies in the first story shall be not less than one foot for every 50 square feet, or major fraction thereof, of elevator car area discharging into the lobby. The width of such exits shall be added to the width of other exits which they may join.

Elevator lobbies shall be enclosed as required for passageways in Part V.

Basements in Institutions

Par. 4445. In Institutions, the walls and floors in contact with earth of all rooms ordinarily occupied by human beings, shall be waterproofed and damp-proofed by an approved method. The waterproofing shall be placed between the floor or wall finish and the ground.

Where living or sleeping rooms are placed in portions of an Institution partly below the ground level, they shall have the required window and glass areas entirely above the grade line. For the height of such rooms, refer to Paragraph 4442.

Rooms for sick or infirm persons or rooms wherein persons are forcibly confined shall not be located wholly or partly below the ground level.

Furnace and Machinery Rooms in Institutions

Par. 4446. Furnace rooms, power rooms and rooms for fuel storage in Institutions shall be enclosed by construction of at least three-hour fire-resistive rating. All openings into such enclosures shall be protected by Class A fire doors or fire-resistive windows.

No such rooms shall be located under any stairway or exit or open directly into any stairway or other required exit from the building.

For required machinery rooms of refrigerating systems refer to Chapter 96.

Toilet Rooms and Bathrooms in Institutions

Par. 4447. There shall be at least one bathroom or one toilet room in each story of an Institution where there is a sick or sleeping room without direct access to such facilities. Such toilet rooms or bathrooms shall be located not more than 75 feet from any bed in such rooms.

Toilet rooms and bathrooms provided for each sex shall be clearly marked "MEN" or "WOMEN".

Toilet rooms shall not connect directly with any room in which food is prepared or served.

Separate compartments shall be provided for each water closet where more than one water closet or a water closet and a urinal or urinals are placed in the same toilet room or bathroom.

Every room or compartment containing a water closet shall be at least 33 inches wide and there shall be a clear space at least 18 inches wide directly in front of the water closet.

Every bathroom in Institutions shall be not less than 5 feet wide in any part and shall contain not less than 36 square feet of gross floor area.

The floor finish in all toilet rooms shall be waterproof and non-absorbent. The walls and ceilings in all toilet rooms shall be smoothly finished.

Shafts and Vertical Openings in Institutions

Par. 4448. In Institutions all shafts shall be enclosed in all stories.

Single openings in floors shall be enclosed either in the story above or below, except as follows:

a. All stairways piercing only one floor above the first floor, serving as required exits from one story, shall be enclosed in the other story, except that one such stairway leading only from the first to the second story need not be enclosed.

b. All stairways not in required exits piercing only one floor above the first need not be enclosed.

c. Stairways leading only from the first floor to lounges, restaurants and similar public rooms in the basement need not be enclosed. All other stairways leading to the basement shall be enclosed in the basement.

These regulations shall not be held to require enclosure of mezzanine or cell-block floors nor of shafts or single openings in such floors only.

All enclosures shall be in accordance with the type requirements of Part V.

Garages and Other Hazardous Occupancies in Institutions

Par. 4449. Garages more than 600 square feet in area or more than one story in height, and other units of hazardous Commercial, Storage or Industrial occupancy in or attached to Institutions shall be constructed in all parts as required for Type A, Fireproof, buildings and separated from the Institutions as required in Section 407.

One story garages 600 square feet or less in area and all other spaces accessible to motor vehicles in or attached to Institutions shall be in all their parts of not lower construction than that required for Type B, Fire-resistant, buildings. Such garages shall be separated from the Institutions by not lower than four-hour fire-resistive construction, with only one opening, not over 25 square feet in area, protected by a self-closing Class A fire door, and also by a vestibule not less than 10 feet long and of not lower than four-hour fire-resistive construction with a self-closing Class A fire door in the end opposite the opening in the separation. Exterior openings serving such garages shall meet the requirements of Paragraph 4716 for larger garages.

SECTION 445

EXIT REQUIREMENTS IN INSTITUTIONS

General Exit Requirements for Institutions

Par. 4450. Every institution shall be provided with safe exits in accordance with the requirements of this Section. When unusually hazardous conditions or conditions not covered by this Code exist in any Institution the Buildings Engineer shall order additional exit facilities to assure the safety of the occupants thereof.

In such institutions as prisons and reformatories where escape of occupants must be prevented, the provisions for exit facilities will be left to the designers and the officials upon whom rests the responsibility for guarding their charges. Sufficient yard area outside of the building shall be provided for all occupants. The Buildings Engineer shall require a formal certification that the exits provided are sufficient in the judgment of the designer and the responsible prison official.

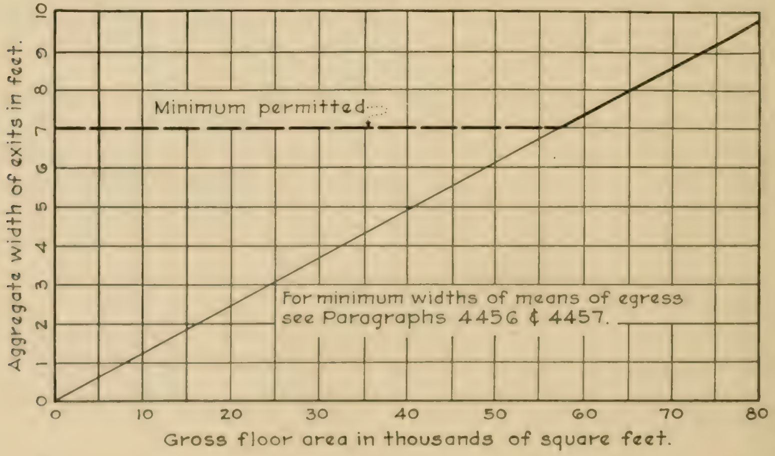
Mezzanine floor areas in an Institution discharging on a floor shall be added to the area of that floor.

For exits from elevator lobbies, see Paragraph 4444.

Width of Exits from Floor Areas in Institutions

Par. 4451. The aggregate width of exits from every floor area above the basement in institutions shall not be less than that shown graphically on the following diagram. The width of each exit shall be not less than the total required width divided by the number of exits, but never less than 42 inches, except where otherwise specifically permitted.

DIAGRAM 4451D



For minimum widths of means of egress see Paragraphs 4456 & 4457.

The required width of exits shall not be reduced in the direction of exit travel.

The exits from one story shall be permitted to be joined with the exits from the story immediately above without adding the widths of such exits, but the number of exits, as required in the following paragraphs, shall not be reduced.

Location and Number of Exits from Stories in Institutions

Par. 4452. Every story above the basement, or each fire division thereof, in institutions, shall have at least two exits, separated and as remote as possible from each other, but the location and number of exits shall be such that the distance a person must travel from the corridor entrance doorway of rooms or groups of rooms to reach an exit from the story in the various types of buildings shall not exceed that given in Column 1 of the following table; however, the distance a person must travel from such entrance doorways in corridors and other locations from which the exits from the story may be reached in one direction only, to a point from which such exits may be reached in two basically different directions, shall not exceed that shown in Column 2; where there are no exit corridors in the story, the distance a person must travel shall be measured from any point in the story.

TABLE 4452T

Type of building	Column 1	Column 2
Fireproof	150 feet	30 feet
Fire-resistant	100 "	25 "
Steel Frame	75 "	20 "
Slow Burning	75 "	20 "
Ordinary	50 "	15 "
Metal	50 "	15 "
Wood Frame	30 "	10 "

In cases where the minimum aggregate width of exits as required by Paagraph 4451 is not sufficient to provide the number of exits needed to satisfy the requirements of this paragraph for maximum distance of travel to them, additional exits shall be provided, and they shall be distributed as uniformly as possible. Not more than one-half of the required exits shall lead into the same lobby or passageway after leaving the floor.

Every occupant of a story shall at all times have access to at least two remote exits from the story.

Roof Exits in Institutions

Par. 4453. A flat roof intended to be occupied by persons shall be considered a room and a story, and exits shall be provided accordingly.

Access to flat roofs on institutions, ordinarily not occupied, shall be provided as follows:

a. From top stories 1500 square feet or less in area, one stairway not less than 24 inches wide, or a scuttle not less than 2 feet by 3 feet.

b. From top stories more than 1500 square feet, but not over 6000 square feet in area, one stairway not less than 24 inches wide and another such stairway or a ladder remote from the first stairway.

c. From top stories over 6000 square feet in area, the two most remote sairways of the building shall be extended to the roof to form an exit not less than 24 inches wide.

Basement Exits in Institutions

Par. 4454. The exits from all basements, cellars, or fire divisions thereof, in institutions, shall be not less than 30 inches wide and at least one exit shall lead directly to a street or an open space leading to a street. Such areas shall have at least two exits, as remote as possible from each other, in the following cases:

a. Where they are more than 1000 square feet in area.

b. Where they contain a room or a group of rooms with institutional occupancy. The exits in such case shall be in accordance with Paragraphs 4451 and 4452.

Where two exits are required by Paragraph 4455 from furnace and power rooms which are located in the basement, at least one such exit shall lead directly to a street or to an open space leading to a street.

Every occupant of a basement shall at all times have access to at least two remote exits, except where only one exit is required.

Room Exits in Institutions

Par. 4455. Exits from rooms in institutions are required to be only 30 inches wide, except that exits from rooms for bedridden patients shall be at least 42 inches wide.

No point in a room or suite of rooms shall be more than 60 feet, measured along an exit path, from an exit therefrom.

The following rooms or suites shall have at least two exits as remote from each other as possible:

a. Every kitchen, storage room and work room of more than 1000 square feet in area.

b. Every furnace room and power room of more than 1600 square feet in area.

c. Every other room or suite of rooms with an aggregate area of more than 2000 square feet.

All such rooms with smaller areas are not required to have more than one exit.

Exits from a suite of rooms or a separate room which is not in a suite shall not lead through other suites or rooms, except that one exit from a separate room with two or more exits may lead through another room.

Required Means of Egress in Institutions

Par. 4456. The required exits in institutions shall consist of one or more doorways, passageways, horizontal exits, interior stairways, fire towers or ramps, or any combination of them, constructed in accordance with Chapters 76 and 77. Such means of egress shall be as follows:

Doorways: The clear width of a single doorway or the aggregate clear width of a multiple doorway shall not be less than the required width of the exit in which it is placed.

Passageways: The clear width of a passageway shall not be less than the required width of the exit in which it is placed.

Horizontal Exits: The clear width of each means of egress forming a horizontal exit shall be at least equal to that of the required exit in which it is placed. There shall be one or more exits leading directly to a street from the story or fire division on each end of a horizontal exit, the aggregate width of which shall be at least equal to the width of the horizontal exit. The areas on each end of a horizontal exit shall be occupied by the same tenant or passageways leading to the exits shall be continuously available to the different tenants of such areas.

Interior Stairways and Fire Towers: The width of such stairways, as defined in Paragraph 7722, in exits leading from stories, or parts thereof, used as institutions, shall be not less than three and one-third times the required width of such exits, as determined from the solid line in Diagram 4451D, but never less than 48 inches.

The width of such stairways in exits leading from roofs, basements and other stories or parts thereof, used for service and similar purposes only, shall be not less than the width of such exits.

No stairway serving upper stories shall be continued below the first floor level, unless they are enclosed in the basement and discharge into an enclosed means of egress leading directly to the street from the basement.

Ramps shall comply with all the requirements for stairways that are applicable.

Conditional Means of Egress in Institutions

Par. 4457. Conditional means of egress, constructed in accordance with Chapters 76 and 77, shall be permitted only to provide additional exits in existing institutions with inadequate exits, or where, in such buildings hereafter erected, it is unreasonable or impracticable to construct required means of egress, but only upon the approval of the Buildings Engineer. Such means of egress shall be as follows:

Exterior Stairways: The width of exterior stairways shall be as required for interior stairways. Such stairways shall be permitted only where at least two required means of egress remote from each other are available from the story. Open exterior stairways shall not be permitted on buildings over 7 stories or 75 feet high.

Exterior Ramps shall comply with all the requirements for exterior stairways that are applicable.

Moving Stairs or Escalators of the horizontal tread type which operate normally in the direction of exit travel may be substituted for an equal width of stairway or ramp but for not more than 10 per cent of the required width of exits. Escalators shall be 48 inches wide.

Passenger Elevators may be given credit as exits by considering each unit of capacity of 35 persons per minute, from the highest loading area, equivalent to one foot of required exit width as determined from the solid line in Diagram 4451D, but not more than 25 per cent of such required exit width shall be substituted by elevators.

Standard Steel Fire Escapes may be permitted only on existing buildings, except on such buildings as are used for the aged, sick or infirm.

Sliding Chutes may be permitted only in orphanages and other similar institutions where occupants are active and under rigid discipline, and shall not be permitted in any institutions for aged, sick or infirm. Each chute may be considered equivalent to 44 inches of stairway width, but chutes shall not be substituted for more than 50 per cent of the required width of all stairways from the area served.

Revolving Doors may be permitted at the rate of one revolving door to one foot of required exit width, as determined from the diagram in Paragraph 4451, except that Type B doors, as defined in Paragraph 7640, shall not be permitted to constitute more than 50 per cent of the width of each exit. Revolving doors shall not be placed within 10 feet of the foot of any stairway.

Ladders may be permitted only in exits from furnace and machinery rooms in basements, and for access to roads.

Emergency Means of Egress in Institutions

Par. 4458. In existing institutions, where additional exits are required under the conditions stated in Paragraph 4450, and it is unreasonable or impracticable to construct required or conditional means of egress, emergency means of egress may be permitted or ordered by the Buildings Engineer.

Such means of egress are windows, ladders in locations other than those permitted in Paragraph 4457, poles, and spiral stairs.

Exit Signs in Institutions

Par. 4459. All exits from stories in institutions more than 2000 square feet in area or more than 2 stories or 30 feet in height, shall be indicated by suitable signs at all times when the building is occupied. Where exit signs are not visible from every point in a corridor, directional signs indicating the exit shall be provided. Directional signs shall also be placed along the line of exits.

For the requirements of exit and directional signs, refer to Paragraph 7892.

SECTION 446

OTHER INTERIOR ARRANGEMENTS FOR INSTITUTIONS

Scope of Other Interior Arrangements for Institutions

Par. 4460. This Section includes the requirements for sick rooms, operating rooms, rooms for the storage of combustible anaesthetics, film storage vaults, living and sleeping rooms, kitchens and special service rooms in Institutions.

Sick Rooms in Institutions

Par. 4461. Sick rooms for children in Institutions shall have a floor area of at least 50 square feet and a volume of at least 600 cubic feet for each occupant. Sick rooms for adults shall have a floor area of at least 75 square feet and a volume of at least 1000 cubic feet for each occupant.

Operating Rooms in Institutions

Par. 4462. The floor finish of operating rooms in Institutions shall be made of materials which will conduct electricity and shall be thoroughly grounded. Each operating room shall be equipped with a humidifying system, capable of maintaining a relative humidity of at least 60 per cent.

Storage of Combustible Anesthetics in Institutions

Par. 4463. In Institutions, enclosures for anesthetizing gases, liquids or other gases used for medicinal purposes shall be of not less than four-hour fire-resistive construction, with openings therein, except exterior windows, protected by self-closing Class A fire doors. Such enclosures shall be well ventilated.

Film Storage Vaults in Institutions

Par. 4464. In Institutions, vaults used for the storage of nitro-cellulose films shall be of four-hour fire-resistive construction, with the openings therein protected by approved vault doors of not less than four-hour fire-resistive rating. The contents of such vaults shall not exceed 750 cubic feet. They shall be provided with an incombustible vent, leading to the exterior of the building, with a net cross-sectional area of at least 150 square inches for each 1000 pounds of film storage capacity. No other vents or ducts shall open into such a vault.

Living and Sleeping Rooms in Institutions

Par. 4465. Living and sleeping rooms, other than sick rooms, and alcoves in Institutions shall be in accordance with the requirements in Paragraph 4365 for such rooms in Dwellings.

Kitchens in Institutions

Par. 4466. All kitchens in Institutions shall be separated from the dining rooms and all other portions of the building by not less than two-hour fire-resistive construction, with all openings therein protected by self-closing Class C fire doors.

Special Service Rooms in Institutions

Par. 4467. *Workshops:* Rooms in Institutions which are used for carpenter shops, paint shops, or storage, shall be enclosed by construction having at least two-hour fire-resistive rating, with all openings protected by Class C fire doors or fire-resistive windows.

Closets: Spaces except kitchens, bathrooms, toilets, pantries and similar accessory rooms, less than 60 square feet in area, in Institutions, shall be considered closets. No closet or storage space shall be placed in, under, over or in direct connection with any stairwell or stairs, except that in Type A, Fireproof, and Type B, Fire-resistant, buildings, closets or storage spaces may be so located if they do not open into the stair enclosure.

Dressing and Locker Rooms: In Institutions, where it is necessary for employees to change clothing, separate dressing rooms shall be provided for males and females. Such dressing rooms shall be located as close to the toilet rooms as possible. Adequate floor space shall be provided for the employees to be accommodated. In no case shall a dressing room contain less than 30 square feet of floor area.

Laundries: In Institutions, laundries with areas over 2000 square feet or 15 per cent of the floor area in the story are moderately hazardous Industrial occupancies and shall be separated as required in Section 407.

Other laundries and drying rooms in Institutions shall be enclosed by construction of at least three-hour fire-resistive rating. All openings into such enclosures shall be protected by Class B fire doors or fire-resistive windows. No heating appliance burning fuel shall be used in any such room.

SECTION 447

ELECTRICAL AND MECHANICAL REQUIREMENTS FOR INSTITUTIONS

Scope of Electrical and Mechanical Requirements in Institutions

Par. 4470. This Section includes the requirements for fire extinguishing appliances, heating and ventilation, fire alarm, lighting, plumbing and other electrical and mechanical equipment for Institutions.

Fire Extinguishing Appliances in Institutions

Par. 4471. Institutional buildings, except Type A, Fireproof, or Type B, Fire-resistant, in which the occupants are bedridden, crippled, insane or otherwise involuntarily confined, shall be equipped throughout with an automatic Class A sprinkle system, except that Class B spacing of sprinklers shall be required in large area attics which may be used for storage purposes, workshops, laundries, storerooms, kitchens, furnace and power rooms and those portions of cellars and basements where hazardous conditions exist. Institutional buildings, except Type A, Fireproof, or Type B, Fire-resistant, buildings, not occupied as above, shall have all cellars, basements, large area attics which may be used for storage, workshops, storerooms, laundries, kitchens, furnace and power rooms protected by automatic sprinklers spaced in accordance with Class B rules, but using Class A pipe sizes, except that Class A spacing may be used in those portions of cellars or basements where non-hazardous conditions exist. An automatic carbondioxide system may be substituted for the sprinklers in rooms containing electrical machinery. Vaults used for the storage of cellulose nitrate X-ray films shall be protected by automatic deluge systems.

Every Institution more than 2 stories or 30 feet, but not more than 5 stories or 55 feet high shall be equipped with a First Aid standpipe system. Institutions over 5 stories or 55 feet in height shall be equipped with a Standard standpipe system. In the First Fire Zone, in Institutions more than 75 feet high, all standpipes shall be extended above the roof and equipped with a hose outlet.

The number of hose stations in each Institutions or fire division thereof shall be such that 75 feet of hose will reach within 20 feet of all points in each story of the building.

Approved portable fire extinguishers shall be provided throughout every Institutional building. One two-and-one-half gallon Class A extinguisher shall be required on each floor and basement for each 5000 square feet of floor area or fraction thereof. In addition, there shall be provided at least one two-and-one-half gallon Class B extinguisher in kitchens and in furnace rooms if the stove or furnace is oil fired.

Fire Alarms in Institutions

Par. 4473. Every Institution 2 stories or more in height shall be provided with manually operated trip fire gongs not less than 8 inches in diameter with incombustible operating mechanism so designed that the gongs may be operated from each story and basement in the building or shall be provided with a Class I fire alarm system in accordance with Section 895.

In addition to the required sending stations, at least one approved automatic detector which will sound the alarm in case of fire shall be placed in the following locations: (1) at the ceiling in front of furnaces, (2) at the ceiling over fuel storage places, (3) at the head of all stairs leading from basements, (4) in the ceiling of every kitchen serving more than 25 persons, (5) in every room for the storage of combustible materials and (6) near any source of great fire hazard.

Hospitals shall also be provided with an approved means for notifying all nurses and attendants in case of fire, or other emergency, by means of alarm devices, telephones or other approved methods.

Heating and Ventilation In Institutions

Par. 4475. Every Institution shall be provided with a heating system capable of maintaining a temperature of at least 70 degrees Fahrenheit, when the outside temperature is zero, in the dormitories, cell blocks, wards, public sitting rooms, dining rooms, service rooms, operating offices, toilets, and such rooms or parts of such buildings where the inmates may congregate, except that rooms or buildings used for open air or outdoor treatment need not be heated.

All rooms and other portions of Institutions used by human beings shall be provided with windows or skylights with an open area of at least one-sixteenth of the floor area, or a gravity or mechanical ventilating system capable of providing one cubic foot of outdoor air per minute for every 10 square feet of floor area, except that sleeping rooms, other than sick rooms, shall be provided with windows as required in Paragraph 4465.

Lighting in Institutions

Par. 4476. Institutions shall be provided with means of artificial illumination of at least the following intensities at the floor level in the locations stated:

a. Corridors, stairways, exits, toilet and service rooms, 3 foot candles.

b. All other rooms used by human beings, 10 foot-candles.

Electrical Equipment in Institutions

Par. 4477. The construction and installation of all electrical appliances, equipment and wiring in Institutions shall comply with the requirements of Part VIII.

Plumbing Requirements in Institutions

Par. 4478. One water closet shall be provided for every 2000 square feet, or fraction thereof, of room area without access to such facilities, in homes for the aged, orphanages, reformatories, or similar Institutions, and for every 3000 square feet or fraction thereof, of such area, in hospitals or similar Institutions.

One lavatory and one bathtub or shower bath shall be provided for every two required water closets for such Institutions.

One sanitary drinking fountain shall be provided in each story for every 6000 square feet of gross floor area or fraction thereof in hospitals and reformatories and for every 4000 square feet or fraction thereof of homes for the aged, orphanages, and similar Institutions. Such fountains shall not be placed in toilet rooms.

Provisions for plumbing fixtures in jails, prisons and other Institutions where persons are involuntarily confined shall be left to the designer and officials upon whom rests the responsibility for their charges.

SECTION 448

EXISTING INSTITUTIONS

General Requirements for Existing Institutions

Par. 4480. Institutions existing at the time this Code is adopted shall be permitted to continue if the requirements of Section 448 are complied with.

Non-Conforming Construction of Institutions

Par. 4481. When an Institution, whose type or construction is not in conformity with the provisions of this Code, is altered or reconstructed in such a manner that the type or construction thereof is affected, any and all parts of such Institution affected by the alteration or reconstruction shall be made to conform to all of the requirements of this Code for type and construction of new Institutions, or as near thereto as the Buildings Engineer may deem reasonable. Repairs on such Institutions are permitted without conforming to this Code.

Non-Conforming Arrangements of Institutions

Par. 4482. Non-conforming interior arrangements of existing Institutions shall be permitted to continue if they do not create a hazard to life. Whenever such interior arrangements are altered, the new arrangements shall conform as nearly as possible to those required for new buildings, but, in any case, the alterations shall create better or safer conditions.

Non-Conforming Heating Plants in Institutions

Par. 4483. Non-conforming heating plants in Institutions shall be made to conform to the requirements for new buildings upon notice from the Buildings Engineer, if they constitute a menace to the public safety or general welfare.

Non-Conforming Arrangement of Institutions

Par. 4484. Where, in an existing Institution, the interior arrangement is not in conformity with the provisions of this Code, it shall be made to conform to the requirements of this Code for the interior arrangement in a new Institution, if such non-conforming arrangement constitutes an imminent hazard to life or property.

However, when an Institution is altered or reconstructed in such a manner that the interior arrangement thereof is changed, the new arrangement shall be made to conform as nearly as possible to the requirements of this Code for the interior arrangement in a new Institution.

Non-Conforming Exits in Institutions

Par. 4485. Where, in an existing Institution, the exits or means of egress are not in conformity with the provisions of this Code, they shall be made to conform to the requirements of this Code for exits and means of egress in new Institution, if such non-conforming exits or means of egress are a hazard to life.

However, when an Institution is altered or reconstructed in such a manner that the exits or means of egress therein are affected, or the means of egress therein are renewed or altered, all such exits or such means of egress shall be made to conform to the requirements of this Code for exits and means of egress in new Institutions.

Non-Conforming Fire Protection in Institutions

Par. 4486. Existing Institutions not provided with fire protection as required by this Code shall be equipped with such fire-extinguishing appliances and equipment so as to comply with the requirements for new Institutions.

Non-Conforming Electrical and Mechanical Equipment in Institutions

Par. 4487. Where, in an existing Institution, the electrical and mechanical equipment does not conform to the provisions of Part IV of this Code, such equipment shall be made to conform, except as hereinafter provided, to the requirements of Part IV of this Code for the electrical and mechanical equipment of new Institutions, if such non-conforming equipment or the absence of such equipment constitutes an imminent menace to life or health.

However, when such non-conforming electrical and mechanical equipment is altered, any and all parts of such equipment affected by the alteration, shall be made to conform to the requirements of this Code for electrical and mechanical equipment in new Institutions.

Non-Conforming Plumbing in Institutions

Par. 4488. Plumbing in existing Institutions not in accordance with the requirements of this Code shall be made to conform, upon notice from the Buildings Engineer, if they constitute a menace to the public safety or general welfare.

SECTION 449

MAINTENANCE AND OPERATION OF INSTITUTIONS

General Maintenance of Institutions

Par. 4491. Every Institution and all parts thereof shall be kept in good repair and in a safe condition while in use, or any other time when the lack of maintenance affects adjoining property; the roof and walls shall be kept so as not to leak; and all means of draining rain water therefrom shall be kept so as not to cause dampness in the walls, ceilings, or basements. All devices or safeguards which are required by this Code when the buildings are erected, altered or repaired shall be maintained in good working order.

All self-closing fire doors shall be kept normally closed. Automatic fire doors and their operating devices shall at all times be maintained in working order.

Exits, and other means of escape when permitted, shall be maintained at all times in good, safe, usable condition.

The enforcement of all fire prevention regulations shall be by the Fire Department.

The enforcement of all sanitary regulations shall be by the Health Department.

General Operation of Institutions

Par. 4492. The operation of Institutions shall be under the supervision of the Fire Department and the Health Department.

Maintenance and Operation of Fire Protection in Institutions

Par. 4494. The maintenance and operation of fire extinguishing appliances and equipment in Institutions shall be under the supervision of the Fire Department, who shall also enforce all regulations pertaining thereto. Refer to Chapter 98.

Maintenance and Operation of Heating and Ventilation in Institutions

Par. 4495. Refer to Part IX for regulations governing the maintenance of heating and ventilating equipment in Institutions. The operation of such equipment shall be under the supervision of the Health Department, who shall also enforce all regulations pertaining thereto.

Maintenance and Operation of Plumbing in Institutions

Par. 4496. The maintenance and operation of plumbing in Institutions shall be under the supervision of the Health Department, who shall also enforce all regulations pertaining thereto.

Maintenance and Operation of Other Electrical and Mechanical Equipment in Institutions

Par. 4497. All other electrical and mechanical equipment in Institutions, including all such equipment not specifically required by this Code, shall be maintained and operated so that, at all times, it will meet the requirements of this Code and will not constitute a life or fire hazard.

CHAPTER 45

CLASS V, OFFICE, BUILDINGS

Sec. 450—General Requirements for Office Buildings.
Sec. 451—Size and Construction of Office Buildings.
Sec. 452—Exterior Requirements for Office Buildings.
Sec. 543—Roof Requirements for Office Buildings.
Sec. 454—Interior Arrangement of Office Buildings.
Sec. 455—Exit Requirements for Office Buildings.
Sec. 456—Other Interior Arrangements for Office Buildings.
Sec. 457—Electrical and Mechanical Requirements for Office Buildings.
Sec. 458—Existing Office Buildings.
Sec. 459—Maintenance and Operation of Office Buildings.

SECTION 450

GENERAL REQUIREMENTS FOR OFFICE BUILDINGS

Scope of Office Buildings

Par. 4500. Office Buildings shall include every building, or portion of a building, designed, constructed or used as a bank, office building, court house, city hall, or as a place of similar occupancy.

Units of office occupancy, in a story, having an aggregate area of less than 2000 square feet and less than 15 per cent of the floor area, which are in another occupancy and incidental thereto, shall be considered to have the same occupancy as that in which they occur.

References for Office Buildings

Par. 4501. For applications, permits, certificates, inspections, violations, vacating, penalties and other administrative regulations, see Part I.

Unusual Conditions in Office Buildings

Par. 4507. In new or existing Office Buildings, where unusual conditions not specifically regulated by this Code create a fire hazard or a health menance, the Buildings Engineer shall require such additional construction, equipment or facilities as may be necessary for the protection of life or health.

Density of Population in Office Buildings

Par. 4508. The normal population of an Office Building shall average not more than one person to each 60 square feet of the area of all floors in the building.

Converting Into Office Buildings

Par. 4509. No building of any other class of occupancy shall be converted into an Office Building unless the building complies with all the requirements of this Code for new Office Buildings.

SECTION 451

SIZE AND CONSTRUCTION OF OFFICE BUILDINGS

General Construction Requirements for Office Buildings

Par. 4510. The construction of Office Buildings shall be in accordance with the type requirements in Part V and also with the requirements of this Section.

Height and Volume Restrictions for Office Buildings

Par. 4511. The height and volume of Office Buildings shall be within the limits fixed by the following table:

TABLE 4511T

Type of building	Height		Maximum volume in cubic feet
	Feet	Stories	
Fireproof	Not hereby limited		Not hereby limited
Fire-resistant	100	9	1,200,000
Steel Frame	60	5	700,000
Slow Burning	60	5	700,000
Ordinary	50	4	500,000
Metal	40	3	350,000
Wood Frame	30	2	150,000

Where an Office Building exceeds in volume the limits set in Table 4511T, it shall be divided into fire divisions by separations constructed as required in Sections 598 and 599, so that the volume of each such fire division will be within such limits.

Exceptions for Exterior Walls of Office Buildings

Par. 4512. The following exceptions are permitted only for Type B, Fire-resistant, Type C, Steel Frame, buildings and for Type E, Ordinary, buildings, with all structural members, floor and roof construction of incombustible materials, and where all such buildings are not over 3 stories or 35 feet in height, and not over 100,000 cubic feet in volume, and are used as Office Buildings:

The exterior walls of such buildings are not required to be in accordance with Paragraphs 5221, 5321 and 5521, but may be of incombustible materials protected against corrosion constructed to have a three-hour fire-resistive rating for outside exposures and a two-hour rating for inside exposures, except where such walls are facing and within 3 feet of any adjoining property line or opposite alley line.

Special Requirements for Exterior Openings in Office Buildings

Par. 4519. The distance from any window or other opening in the exterior wall of an Office Building, or unit, to any door, with an area exceeding 45 square feet, leading directly into a garage, or into a unit of hazardous Commercial, Storage or Industrial occupancy, shall meet the following requirements:

a. Such distance above the top, or the level of the top for a distance of 5 feet beyond the sides, of said door shall be not less than 10 feet and such distance from any side of said door shall be not less than 5 feet.

b. When such distance above the top, or the level of the top for a distance of 10 feet beyond the sides, of said door is less than 20 feet and such distance from any side of said door is less than 10 feet, the said window or other opening shall be protected by a fixed fire-resistive window or a Class D fire door.

Whenever the distance from any said window or other opening to any door with an area of 45 square feet or less or any window or other opening in the exterior wall of a garage or a hazardous Commercial, Storage or Industrial Building or unit is less than 5 feet at any side or less than 10 feet below the bottom of said window or other opening, the said window or other opening shall be protected by a fixed fire-resistive window or a Class D fire door.

SECTION 452

EXTERIOR REQUIREMENTS FOR OFFICE BUILDINGS

Entrances to Office Buildings

Par. 4521. Entrances to Office Buildings shall be at least equal in width to that of the required exits in which they are placed.

Projections from Office Buildings

Par. 4522. Marquees, signs, footings and other similar projections, on or of every Office Building projecting beyond the building lines into a street or other public way shall be in accordance with Chapter 21

SECTION 453

ROOF REQUIREMENTS FOR OFFICE BUILDINGS

Scuttles and Bulkheads on Office Buildings

Par. 4535. Required scuttles in the roof of an Office Building shall be in accordance with Paragraph 4553.

Skylights on Office Buildings

Par. 4537. Skylights are not required in Office Buildings, but, if installed, they shall be constructed in accordance with Section 766.

Roof Drainage on Office Buildings

Par. 4538. The roof surface of every Office Building shall be arranged so as to drain directly to gutters or leaders. Roofs having parapet walls which will impound water shall be provided with scuppers not less than 8 by 12 inches, one for each 1000 square feet of roof, or fraction thereof. No scuppers shall be placed in any parapet wall which is facing and is less than 5 feet from any adjoining property line.

Gutters and Downspouts on Office Buildings

Par. 4539. Gutters and leaders shall be provided on Office Buildings to properly conduct the water from the roofs thereof where necessary to prevent damage to any property. Water from any part of an Office Building shall not be allowed to fall or flow on a public footway, except from window sills, copings and cornices, not more than one foot wide and from awnings or marquees discharging off the outer edge.

SECTION 454

INTERIOR ARRANGEMENT OF OFFICE BUILDINGS

Scope of Interior Arrangements of Office Buildings

Par. 4540. This Section includes the requirements for arranging and constructing of entrance lobbies, suites, elevator lobbies, basements, furnace rooms, machinery rooms and toilet rooms, shafts, vertical openings and garages in Office Buildings.

Entrance Lobbies in Office Buildings

Par. 4541. Entrance lobbies or vestibules of every Office Building shall be not less in width than the exit in which they are placed.

Heights of Rooms in Office Buildings

Par. 4542. No minimum heights of rooms in Office Buildings are required.

Suites in Office Buildings

Par. 4543. Single offices and office suites shall be so arranged that the minimum floor area thereof shall be not less than 30 square feet per person.

Elevator Lobbies in Office Buildings

Par. 4544. Lobbies or other similar landing spaces for elevators permitted to be used as means of egress in all stories of Office Buildings, except the first, shall have an aggregate area of not less than 2 per cent of the gross floor area served.

The width of exits from passenger elevator lobbies in the first story shall be not less than one foot for every 50 square feet, or major fraction thereof, of elevator car area discharging into the lobby. The width of such exits shall be added to the width of other exits which they may join.

Elevator lobbies shall be enclosed as required for passageways in Part V.

Furnace and Machinery Rooms in Office Buildings

Par. 4546. Furnace rooms, power rooms and rooms for fuel storage in an Office Building shall be separated from the rest of the building, including stairways, by at least a two-hour fire-resistive construction. All openings in such separations shall be protected by Class B self-closing fire doors or fire-resistive windows.

No such rooms shall be located under any stairway or exit or open directly into any stairway or other required exit from the building.

For required machinery rooms of refrigerating systems, refer to Chapter 96.

Toilet Rooms in Office Buildings

Par. 4547. Every Office Building shall have at least one toilet room for each sex using the building, located in every 10,000 square feet of floor area or fraction thereof, except buildings 2000 square feet or less in area, were only one toilet room is required. Each toilet room shall be clearly marked to indicate the sex for which it is intended, except where only one toilet room is required.

No toilet room shall connect directly with any kitchen, dining room, or other room where food or food products are prepared or handled.

Separate compartments shall be provided for each water closet where more than one water closet, or a water closet and a urinal or urinals are placed in the same toilet room.

Every room or compartment containing a water closet shall be not less than 33 inches wide and there shall be a clear space at least 18 inches wide directly in front of the water closet.

The floor finish in all toilet rooms shall be waterproof and non-absorbent. The walls and ceilings shall be smoothly finished.

Shafts and Vertical Openings in Office Buildings

Par. 4548. In Office Buildings all shafts shall be enclosed in all stories except stairways extending from the basement to not beyond the second floor need not be enclosed in any story.

Single openings in floors shall be enclosed in the story above or below except as follows:

a. Stairways piercing the first or second floor only need not be enclosed.

b. Stairways piercing only one floor above the second, serving as required exits from one story, shall be enclosed in the other story.

c. Other stairways piercing only one floor above the second need not be enclosed.

These regulations shall not be held to require the enclosure of mezzanine floors nor of shafts or single openings in such floors only.

All enclosures shall be in accordance with the type requirements in Part V.

Garages and Other Hazardous Occupancies in Office Buildings

Par. 4549. Garages more than 600 square feet in area or more than one story in height and other units of hazardous Commercial, Storage or Industrial occupancy in or attached to Office Buildings shall be separated from the Office Buildings as required in Section 407.

One story garages 600 square feet or less in area and all other spaces accessible to motor vehicles in or attached to Office Buildings shall be separated therefrom by not lower than two-hour fire-resistive construction with only one opening not over 25 square feet in area protected by a self-closing Class A fire door.

Openings in all required separations shall be further provided with a vestibule not less than 10 feet long and of not lower than two-hour fire-resistive construction with a self-closing Class B fire door in the end opposite the opening in the separation.

Exterior openings serving such a garage not exceeding 600 square feet in area and not over one story in height shall meet the requirements of Paragraph 4716 for larger garages.

SECTION 455

EXIT REQUIREMENTS FOR OFFICE BUILDINGS

General Exit Requirements for Office Buildings

Par. 4550. Every Office Building shall be provided with safe exits in accordance with the requirements of this Section. When unusually hazardous conditions or conditions not covered by this Code exist in any Office Building the Buildings Engineer shall order additional exit facilities to assure the safety of the occupants thereof.

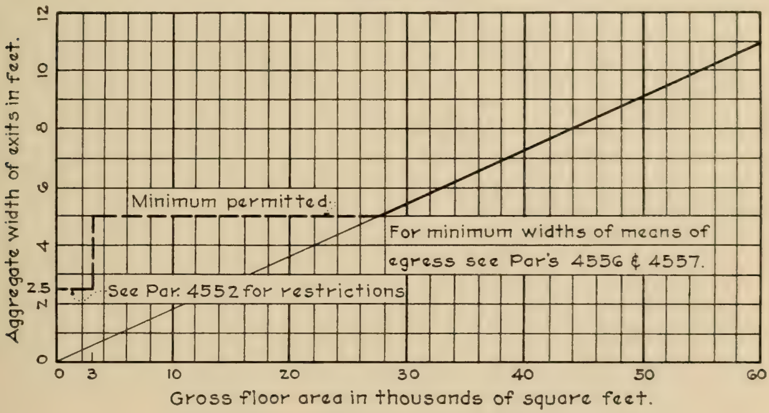
Mezzanine floor areas in an Office Building discharging on a floor below shall be added to the area of that floor.

For exits from elevator lobbies, see Paragraph 4544.

Width of Exits in Office Buildings

Par. 4551. The aggregate width of exits from every floor area above the basement in Office Buildings shall not be less than that shown graphically on the following diagram. The width of each exit shall be not less than the required aggregate width divided by the number of exits, but never less than 30 inches, except where otherwise specifically permitted.

DIAGRAM 4551D



The required width of exits shall not be reduced in the direction of exit travel.

The exits from one story shall be permitted to be joined with the exits from the story immediately above without adding the width of such exits, but the number of exits, as required in the following Paragraphs, shall not be reduced.

Location and Number of Exits from Stories in Office Buildings

Par. 4552. Every story above the basement, or each fire division thereof, in Office Buildings, shall have at least two exits, separated and as remote as possible from each other, except as noted below, but the location and number of exits shall be such that the distance a person must travel from the corridor entrance doorway of rooms or suites of rooms, to reach an exit from the story in the various types of buildings shall not exceed that given in Column 1 of the following table; however, the distance a person must travel from such entrance doorway in corridors and other locations from which exits from the story may be reached in one direction only, to a point from which such exits may be reached in two basically different directions, shall not exceed that shown in Column 2; where there are no exit corridors in the story, the distance a person must travel shall be measured from any point in the story.

TABLE 4552T

Type of building	Column 1	Column 2
Fireproof	200 feet	50 feet
Fire-resistant	160 "	40 "
Steel Frame	100 "	30 "
Slow Burning	75 "	30 "
Ordinary	75 "	25 "
Metal	60 "	25 "
Wood Frame	40 "	20 "

In cases where the minimum aggregate width of exits as required by Paragraph 4551 is not sufficient to provide the number of exits needed to satisfy the requirements of this Paragraph for maximum distance of travel to them, additional exits shall be provided and they shall be distributed as uniformly as possible. Not more than one-half the required exits shall lead into the same lobby or passageway after leaving the story.

Stories above the basement or fire divisions thereof, of 3000 square feet or less in area in Type A, Fireproof, or Type B, Fire resistant, buildings of any height; in Type C, Steel Frame, or Type D, Slow Burning, buildings not over 3 stories or 40 feet high, and in Type E, Ordinary, Type F, Metal, or Type G, Wood Frame, buildings not over 2 stories or 30 feet high, are not required to have more than one exit, which exit shall not lead through another fire division in the same story. In stories with one exit, the distance a person must travel from any corridor entrance door of rooms, or suites of rooms, to the exit, from that story, shall not exceed the distance given in Column 2 of Table 4552T. Where there are no exit corridors, such distance shall be measured from any point in the story.

Every occupant of a story shall at all times have access to at least two remote exits from the story, except where only one exit is required.

Roof Exits in Office Buildings

Par. 4553. A flat roof intended to be occupied by persons shall be considered a room and a story, and exits shall be provided accordingly.

Access to flat roofs, in office buildings, ordinarily not occupied, shall be provided as follows:

a. From top stories 3000 square feet or less in area, one stairway not less than 24 inches wide or a scuttle not less than 2 feet by 3 feet.

b. From top stories more than 3000 square feet, but not over 7000 square feet in area, one stairway not less than 24 inches wide and another such stairway or a ladder remote from the first stairway.

c. From top stories over 7000 square feet in area, the two most remote stairways of the building shall be extended to the roof to form an exit not less than 24 inches wide.

Basement Exits in Office Buildings

Par. 4554. The exits from all basements, cellars, or fire divisions thereof, in Office Buildings, shall be not less than 30 inches wide and at least one exit shall lead directly to a street or an open space leading to a street. Such area shall have at least two exits, as remote as possible from each other, in the following cases:

a. Where they are more than 1000 square feet in area.

b. Where they contain rooms or groups of rooms used as offices. The exits in such case shall be in accordance with Paragraphs 4551 and 4552.

Where two exits are required by Paragraph 4555 from furnace-and power rooms which are located in the basement, at least one such exit shall lead directly to a street or to an open space leading to a street.

Every occupant of a basement shall at all times have access to at least two remote exits, except where only one exit is required.

Room Exits in Office Buildings

Par. 4555. The exits from every room, or suite of rooms, in Office Buildings, shall be at least 30 inches wide.

No point in a room, or suite of rooms, shall be more than 60 feet, measured along a travel path, from an exit therefrom.

Every room or suite of rooms, except as noted below, with an aggregate area of more than 3000 square feet, shall have at least two exits as remote from each other as possible.

Furnace rooms and power rooms shall have not less than two remote exits if they are more than 1600 square feet in area.

Storage and work rooms more than 1000 square feet in area shall have not less than two remote exits.

Exits from suites of rooms or separate rooms which are not a part of a suite shall not lead through other rooms or suites, except that from separate rooms with two or more exits, one exit may lead through another room, provided with the required exits.

Required Means of Egress in Office Buildings

Par. 4556. The required exits in Office Buildings shall consist of one or more doorways, passageways, horizontal exits, interior stairways, fire towers or ramps, or any combination of them, constructed in accordance with Chapters 76 and 77. Such means of egress shall be as follows:

Doorways: The clear width of a single doorway or the aggregate clear width of a mutiple doorway shall not be less than the required width of the exit in which it is placed.

Passageways: The clear width of a passageway shall not be less than the required width of the exit in which it is placed.

Horizontal Exits: The clear width of each means of egress forming a horizontal exit shall be at least equal to that of the required exit in which it is placed. There shall be one or more exits leading directly to a street from the story or fire division on each end of a horizontal exit, the aggregate width of which shall be at least equal to the width of the horizontal exit. The areas on each end of a horizontal exit shall be occupied by the same tenant or passageways leading to the exits shall be continuously available to the different tenants of such areas.

Interior Stairways and Fire Towers: The width of such stairways, as defined in Paragraph 7722, in exits leading from stories, or portions thereof, used for Office occupancy, shall be not less than one and two-thirds times the required width of such exits, as determined from solid line in Diagram 4551D, but not less than 44 inches, except that the width of such stairways serving stories, or fire divisions thereof, not over 2500 square feet in area, shall be at least 36 inches.

The width of such stairways in exits leading from roofs, basements and other stories or parts thereof, used for service and similar purposes only, shall be not less than the width of such exits.

No stairway serving upper stories shall be continued below the first floor level, unless they are enclosed in the basement and discharge into an enclosed means of egress leading directly to the street from the basement.

Ramps shall comply with all the requirements for stairways that are applicable.

Conditional Means of Egress in Office Buildings

Par. 4557. Conditional means of egress, constructed in accordance with Chapters 76 and 77, shall be permitted only to provide additional exits in existing office buildings with inadequate exits, or where, in such buildings hereafter erected, it is unreasonable or impracticable to construct required means or egress, but only upon the approval of the Buildings Engineer. Such means of egress shall be as follows:

Exterior Stairways: The width of exterior stairways shall be as required for interior stairways.

Such stairways shall be permitted only where at least two required means of egress remote from each other are available from the story. Open exterior stairways shall not be permitted on buildings over 7 stories or 75 feet high.

Exterior Ramps shall comply with all the requirements for exterior stairways that are applicable.

Moving Stairs or Escalators of the horizontal tread type which operate normally in the direction of exit travel may be substituted for an equal width of stairway or ramp but for not more than 50 per cent of the required aggregate width of exits. Escalators shall not be less than 36 inches wide.

Passenger Elevators may be given credit as exits by considering each unit of capacity of 35 persons per minute, from the highest loading area, equivalent to one foot of required exit width as determined from the solid line in Diagram 4551D, but not more than 50 per cent of such required exit width shall be substituted by elevators.

Standard Steel Fire Escapes may be permitted only on existing buildings.

Revolving Doors may be permitted at the rate of one revolving door to one foot of required exit width, as determined from the diagram in Paragraph 4551, except that Type B doors, as defined in Paragraph 7640, shall not be permitted to constitute more than 50 per cent of the width of each exit. Revolving doors shall not be placed within 10 feet of the foot of any stairway.

Spiral Stairs may be permitted only from a mezzanine floor not over 200 square feet in area.

Ladders may be permitted only in exits from furnace and machinery rooms in basements, and for access to roofs.

Emergency Means of Egress in Office Buildings

Par. 4558. In existing Office Buildings, where additional exits are required under the conditions stated in Paragraph 4550, and it is unreasonable or impracticable to construct required or conditional means of egress, emergency means of egress may be permitted or ordered by the Buildings Engineer.

Such means of egress are windows, sliding chutes, spiral stairs and ladders in locations other than those permitted in Paragraph 4557, and poles.

Exit Signs in Office Buildings

Par. 4559. All exits from stories in Office Buildings more than 2500 square feet in area, or more than 3 stories or 35 feet in height, shall be indicated by suitable signs at all times when the building is occupied. Where exit signs are not visible from every point in a corridor, directional signs indicating the exits shall be provided. Directional signs shall also be placed along the line of exits.

For requirements of exit and directional signs, refer to Paragraph 7892.

SECTION 456

OTHER INTERIOR ARRANGEMENTS FOR OFFICE BUILDINGS

Scope of Other Interior Arrangements for Office Buildings

Par. 4560. This Section includes the requirements for special service rooms and arcades in Office Buildings.

Special Service Rooms in Office Buildings

Par. 4561. *Dressing and Locker Rooms:* In Office Buildings, where it is necessary for employees to change clothing, separate dressing rooms shall be provided for males and females. Such dressing rooms shall be located as close to the toilet rooms as possible.

Adequate floor space shall be provided for the employees to be accommodated. In no case shall a dressing room contain less than 30 square feet of floor area.

Closets: Spaces, except toilet rooms, less than 60 square feet in area, in Office Buildings, shall be considered closets. No closet or storage space shall be placed in, under, over, or in direct connection with any stairwell except that in Type A, Fireproof, and Type B, Fire-resistant, buildings, closet or storage spaces may be so located if they do not open into the stair enclosure.

Workshops and Storage Rooms: All work rooms in Office Buildings which are used for carpenter shops, paint shops or storage rooms shall be enclosed with at least two-hour fire-resistive construction, with the openings therein protected by Class C fire doors or fire-resistive windows.

Arcades in Office Buildings

Par. 4568. Arcades in Office Buildings shall be open at both ends, and shall have a width of not less than 16 feet, and a clear height of not less than 20 feet. No loose furniture, merchandise, combustible decorations or other obstructions shall be permitted in arcades. No signs or other projections, or parts thereof, shall be permitted less than 8 feet above the pavement.

SECTION 457

ELECTRICAL AND MECHANICAL REQUIREMENTS FOR OFFICE BUILDINGS

Scope of Electrical and Mechanical Requirements in Office Buildings

Par. 4570. This Section includes the requirements for fire extinguishing appliances, heating and ventilation, fire alarm, lighting, plumbing and other electrical and mechanical equipment for Office Buildings.

Fire Extinguishing Appliances in Office Buildings

Par. 4571. Automatic Class A sprinklers shall be installed throughout in cellars, basements, workshops, furnace and power rooms in all Office Buildings over 2 stories or 30 feet in height, except in Type A, Fireproof, or Type B, Fire-resistant, buildings. An automatic carbondioxide system may be substituted for the sprinklers in rooms containing electrical machinery.

Every Office Building 75 feet or less in height shall be equipped with either a First Aid standpipe system or portable fire extinguishers. Buildings more than 75 feet high shall be equipped with either a Fire Department standpipe system and portable extinguishers, or with a Standard standpipe system.

Where standpipes are provided, the number of hose stations in each Office Building or fire division thereof shall be such that 75 feet of hose will reach within 20 feet of all points in each story of the building.

In the First Fire Zone, in Office Buildings more than 75 feet high, all standpipes shall be extended above the roof and equipped with a hose outlet.

Where portable fire extinguishers are provided in Office Buildings, there shall be at least one two-and-one-half gallon Class A portable extinguisher in each story and basement for every 2500 square feet of floor area, or fraction thereof.

Fire Alarms in Office Buildings

Par. 4573. All Office Buildings more than 3 stories in height shall be provided with Class II fire alarm system in accordance with Section 895.

In addition to the required sending stations, at least one approved automatic detector shall be placed at the following locations: (1) at the ceiling in front of furnaces, (2) at the head of stairs leading from basements, and (3) near any source of great fire hazard.

Heating and Ventilation in Office Buildings

Par. 4575. Every Office Building shall be provided with a heating system capable of maintaining a temperature of at least 70 degrees Fahrenheit in offices, banking rooms, stores, dressing, locker and toilet rooms, when the outside temperature is zero.

All rooms and other portions used by human being in Office Buildings shall be provided with windows or skylights with an open area of at least one-sixteenth of the floor area or a gravity or mechanical ventilating system capable of providing one cubic foot of outdoor air per minute for every ten square feet of floor area.

Lighting in Office Buildings

Par. 4576. If an Office Building is intended to be occupied at times when natural light is inadequate or not available, it shall be provided with lighting facilities capable of furnishing artificial illumination of not less than 10 foot-candles at a plane 30 inches above the floor in all rooms, and not less than 3 foot-candles at the floors of all corridors, exits, toilet and service rooms.

Electrical Equipment in Office Buildings

Par. 4577. The construction and installation of all electrical appliances, equipment and wiring in Office Buildings shall comply with the requirements of Part VIII.

Plumbing Requirements in Office Buildings

Par. 4578. Every Office Building shall be provided with plumbing equipment as follows:

At least one water closet for every 2000 square feet of gross floor area or fraction thereof. Two urinals may be subsituted for one required water closet for males, but for not more than one-third of the required water closets.

One lavatory for every two water closets and for every four urinals, but at least one in each toilet room.

One sanitary drinking fountain in each story in each 6000 square feet of floor area or fraction thereof. Drinking fountains shall not be installed in toilet rooms.

SECTION 458

EXISTING OFFICE BUILDINGS

General Requirements for Existing Office Buildings

Par. 4580. Office Buildings existing at the time this Code is adopted shall be permitted to continue if the requirements of Section 458 are complied with.

Non-Conforming Construction of Office Buildings

Par. 4581. When an Office Building, whose type or construction is not in conformity with the provisions of this Code, is altered or reconstructed in such a manner that the type or construction thereof is affected, any and all parts of such Office Building affected by the alteration or reconstruction shall be made to conform to all of the requirements of this Code for type and construction of new Office Buildings, or as near thereto as the Buildings Engineer may deem reasonable. Repairs on such Office Buildings are permitted without conforming to this Code.

Non-Conforming Arrangements of Office Buildings

Par. 4582. Non-conforming interior arrangements of existing Office Buildings shall be permitted to continue if they do not create a hazard to life. Whenever such interior arrangements are altered, the new arrangements shall conform as nearly as possible to those required for new buildings, but, in any case, the alterations shall create better or safer conditions.

Non-Conforming Heating Plants in Office Buildings

Par. 4583. Non-conforming heating plants in Office Buildings shall be made to conform to the requirements for new buildings upon notice from the Buildings Engineer, if they constitute a menace to the public safety or general welfare.

Non-Conforming Arrangement of Office Buildings

Par. 4584. Where, in an existing Office Building, the interior arrangement is not in conformity with the provisions of this Code, it shall be made to conform to the requirements of this Code for the interior arrangement in a new Office Building, if such non-conforming arrangement constitutes an imminent hazard to life or property.

However, when an Office Building is altered or reconstructed in such a manner that the interior arrangement thereof is changed, the new arrangement shall be made to conform as nearly as possible to the requirements of this Code for the interior arrangement in a new Office Building.

Non-Conforming Exits in Office Buildings

Par. 4585. Where, in an existing Office Building, the exits or means of egress are not in conformity with the provisions of this Code, they shall be made to conform to the requirements of this Code for exits and means of egress in new Office Buildings, if such non-conforming exits or means of egress are a hazard to life.

However, when an Office Building is altered or reconstructed in such a manner that the exits or means of egress therein are affected, or the means of egress therein are renewed or altered, all such exits or such means of egress shall be made to conform to the requirements of this Code for exits and means of egress in new Office Buildings.

Non-Conforming Fire Protection in Office Buildings

Par. 4586. Existing Office Buildings not provided with fire protection as required by this Code shall be equipped with such fire extinguishing appliances and equipment so as to comply with the requirements for new Office Buildings, upon notice from the Buildings Engineer, where and as requested jointly by the Board of Fire Commissioners and the Buildings Engineer.

Non-Conforming Electrical and Mechanical Equipment in Office Buildings

Par. 4587. Where, in an existing Office Building, the electrical and mechanical equipment does not conform to the provisions of Part IV of this Code, such equipment shall be made to conform, except as hereinafter provided, to the requirements of Part IV of this Code for the electrical and mechanical equipment of new Office Buildings, if such non-conforming equipment or the absence of such equipment constitutes an imminent menace to life or health.

However, when such non-conforming electrical and mechanical equipment is altered, any and all parts of such equipment affected by the alteration, shall be made to conform to the requirements of this Code for electrical and mechanical equipment in new Office Buildings.

Non-Conforming Plumbing in Office Buildings

Par. 4588. Plumbing in existing Office Buildings not in accordance with the requirements of this Code shall be made to conform, upon notice from the Buildings Engineer, if they constitute a menace to the public safety or general welfare.

SECTION 459

MAINTENANCE AND OPERATION OF OFFICE BUILDINGS

General Maintenance of Office Buildings

Par. 4591. Every Office Building and all parts thereof shall be kept in good repair and in a safe condition while in use, or any other time when the lack of maintenance affects adjoining property; the roof and walls shall be kept so as not to leak; and all means of draining rain water therefrom shall be kept so as not to cause dampness in the walls, ceilings, or basements. All devices or safeguards which are required by this Code when the buildings are erected, altered or repaired shall be maintained in good working order.

All self-closing fire doors shall be kept normally closed. Automatic fire doors and their operating devices shall at all times be maintained in working order.

Exits, and other means of escape when permitted, shall be maintained at all times in good, safe, usable condition.

The enforcement of all fire prevention regulations shall be by the Fire Department.

The enforcement of all sanitary regulations shall be by the Health Department.

General Operation of Office Buildings

Par. 4592. The operation of Office Buildings shall be under the supervision of the Fire Department and the Health Department.

Maintenance and Operation of Fire Protection in Office Buildings

Par. 4594. The maintenance and operation of fire extinguishing appliances and equipment in Office Buildings shall be under the supervision of the Fire Department, who shall also enforce all regulations pertaining thereto. Refer to Chapter 98.

Maintenance and Operation of Heating and Ventilation in Office Buildings

Par. 4595. Refer to Part IX for regulations governing the maintenance of heating and ventilating equipment in Office Buildings. The operation of such equipment shall be under the supervision of the Health Department, who shall also enforce all regulations pertaining thereto.

Maintenance and Operation of Plumbing in Office Buildings

Par. 4596. The maintenance and operation of plumbing in Office Buildings shall be under the supervision of the Health Department, who shall also enforce all regulations pertaining thereto.

Maintenance and Operation of Other Electrical and Mechanical Equipment in Office Buildings

Par. 4597. All other electrical and mechanical equipment in Office Buildings, including all such equipment not specifically required by this Code, shall be maintained and operated so that, at all times, it will meet the requirements of this Code and will not constitute a life or fire hazard.

CHAPTER 46

CLASS VI, COMMERCIAL, BUILDINGS

Sec. 460—General Requirements for Commercial Buildings.

Sec. 461—Size and Construction of Commercial Buildings.

Sec. 462—Exterior Requirements for Commercial Buildings.

Sec. 463—Roof Requirements for Commercial Buildings.

Sec. 464—Interior Arrangement of Commercial Buildings.

Sec. 465—Exit Requirements for Commercial Buildings.

Sec. 466—Other Interior Arrangements for Commercial Buildings.

Sec. 467—Electrical and Mechanical Requirements for Commercial Buildings.

Sec. 468—Existing Commercial Buildings.

Sec. 469—Maintenance and Operation of Commercial Buildings.

SECTION 460

GENERAL REQUIREMENTS FOR COMMERCIAL BUILDINGS

Scope of Commercial Buildings

Par. 4600. Commercial Buildings shall include every building, or portion of a building, designed, constructed or used for the sale or exchange in any manner or form of any and all goods, merchandise, products or services, or as a place for similar occupancy or use.

Units of light hazardous and moderately hazardous commercial occupancy, in a story, having an aggregate area of less than 2000 square feet and less than 15 per cent of the floor area, which are in another occupancy, and incidental thereto, shall be considered to have the same occupancy as that in which they occur.

Commercial Buildings shall include all places of industrial occupancy if the entire output of such occupancy is stored and sold in the Commercial Building in which it is located.

References for Commercial Buildings

Par. 4601. For applications, permits, certificates, inspections, violations, vacating, penalties and other administrative regulations, see Part I.

Classification of Commercial Buildings

Par. 4603. Commercial Buildings shall be classified in accordance with the degree of fire hazard created by their occupancy, as follows:

Hazardous Commercial Buildings shall include every building or portion thereof used for the sale or exchange of:

Calcium Carbide
Drugs, wholesale
Feed
Gases, flammable, poisonous and irritating
Hydrofluoric acids
Junk
Lacquer
Motor vehicles, second hand
Naval stores
Nitric acid
Oxidizing agents
Paints
Petroleum products
Pyroxylin and pyroxylin plastic products
Sulphuric acid
Varnish

and similar hazardous, highly combustible, flammable or explosive products or materials.

Moderately Hazardous Commercial Buildings shall include department stores, furrier stores with work, photographic studios and similar buildings, and every building or portion thereof used for the sale or exchange of:

Art Dealers' stock
Auction goods
Clothing, second hand
Furniture
Hardware, with paints or lacquers
Stationery
Wallpaper

and similar moderately hazardous or not highly combustible or flammable products or materials.

Light Hazardous Commercial Buildings shall include barber shops, furrier stores without work, markets, restaurants, tailor shops, telephone exchanges, drug stores, taverns and similar buildings and every building or portion thereof used for the sale or exchange of:

Agricultural implements
Asbestos goods
Canned goods
Hats, men's
Hides
Ice

Cement
Ceramics
Clothing, new
Dairy products
Dry goods
Electrical goods and equipment
Flour
Groceries
Hardware, without paint
Jewelry
Leather goods
Machinery
Metals
Plumbers' supplies
Rugs
Seeds
Sporting goods
Tires

and similar incombustible or non-explosive products or materials.

Unusual Conditions in Commercial Buildings

Par. 4607. In new or existing Commercial Buildings, where unusual conditions not specifically regulated by this Code create a fire hazard or a health menace, the Buildings Engineer shall require such additional construction, equipment or facilities as may be necessary for the protection of life or health.

Density of Population in Commercial Buildings

Par. 4608. The normal population of a Commercial Building shall average not more than one person to each 30 square feet of the area of all floors in the building.

Converting Into Commercial Buildings

Par. 4609. No building of any other class of occupancy shall be converted into a Commercial Building unless the building complies with all the requirements of this Code for new Commercial Buildings.

SECTION 461

SIZE AND CONSTRUCTION OF COMMERCIAL BUILDINGS

General Construction Requirements for Commercial Buildings

Par. 4610. The construction of Commercial Buildings shall be in accordance with the type requirements in Part V and also with the requirements of this Section.

Height and Volume Restrictions for Commercial Buildings

Par. 4611. The height and volume of Commercial Buildings shall be within the limits fixed by the following table, except as further restricted below:

TABLE 4611T

Type of building	Height		Maximum volume in cubic feet
	Feet	Stories	
Fireproof	Not hereby limited		Not hereby limited
Fire-resistant	80	7	1,200,000
Steel Frame	60	5	700,000
Slow Burning	60	5	700,000
Ordinary	45	4	500,000
Metal	35	3	350,000
Wood Frame	30	2	150,000

Type G, Wood Frame or Type F, Metal, buildings shall not be used for hazardous Commercial Buildings, except as permitted in Part III.

Hazardous Commercial Buildings constructed less than 100 feet from a Public Assembly Building, Private Assembly Building, Dwelling or Institution, shall be Type A, fireproof buildings.

Where a Commercial Buillding exceeds in volume the limits set in Table 4611T, it shall be divided into fire divisions by separations constructed as required in Sections 598 and 599, so that the volume of each such fire division will be within such limits.

Exceptions for Exterior Walls of Commercial Buildings

Par. 4612. The following exceptions are permitted only for Type B, Fire-resistant, Type C, Steel Frame, buildings and Type E, Ordinary, buildings, with all structural members, floor and roof construction of incombustible materials, and where all such buildings are not over 2 stories or 30 feet in height, and not over 50,000 cubic feet in volume, and are used as Commercial Buildings:

The exterior walls of such buildings are not required to be in accordance with Paragraphs 5221, 5321 and 5521, but may be of incombustible materials protected against corrosion constructed to have a three-hour fire-resistive rating for outside exposures and a two-hour rating for inside exposures, except where such walls are facing and within 3 feet of any adjoining property line or opposite alley line.

Special Requirements for Exterior Openings in Hazardous Commercial Buildings

Par. 4616. In hazardous Commercial buildings or units, every exterior window opening which faces any adjoining property line or any opposite alley line and is less than 20 feet from said property line or alley line, shall be protected by a fire-resistive window, except that when such window opening is less than 10 feet from said property line or alley line, it shall be further protected by fixed sash.

The distance from any door, window or other opening in the exterior walls of a hazardous Commercial building, or unit, to any window or other opening in the exterior wall of another building or unit of occupancy shall meet the requirements of Paragraphs 4119, 4219, 4319, 4419, 4519, 4619, 4719 and 4819.

Every window opening in the exterior wall of a hazardous Commercial Building, or unit, which opening is less than 10 feet from any exterior opening serving another occupancy, shall be protected by a fixed fire-resistive window.

No exterior woodwork of any kind shall be placed less than 20 feet above the top, or less than 5 feet from the sides, of any exterior door, exceeding 45 square feet in area, leading directly into a hazardous Commercial occupancy.

Special Requirements for Exterior Openings in Moderately and Light Hazardous Commercial Buildings

Par. 4619. In moderately hazardous or light hazardous Commercial Buildings, or units, every exterior window opening which faces any adjoining property line or any opposite alley line and is less than 20 feet from said property line or alley line, shall be protected by a fire-resistive window.

The distance from any window or other opening in the exterior wall of a moderately hazardous or a light hazardous Commercial Building, or unit, to any door, with an area exceeding 45 square feet, leading directly into a garage, or into a unit of hazardous Commercial, Storage or Industrial occupancy, shall meet the following requirements:

a. Such distance above the top, or the level of the top for a distance of 5 feet beyond the sides, of said door shall be not less than 10 feet and such distance from any side of said door shall be not less than 5 feet.

b. When such distance above the top, or the level of the top for a distance of 10 feet beyond the sides, of said door is less than 20 feet and such distance from any side of said door is less than 10 feet, the said window or other opening shall be protected by a fixed fire-resistive window or a Class D fire door.

Whenever the distance from any said window or other opening to any door with an area of 45 square feet or less or any window or other opening in the exterior wall of a garage or a hazardous Commercial, Storage or Industrial Building or unit is less than 5 feet at any side or less than 10 feet below the bottom of said window or other opening, the said window or other opening shall be protected by a fixed fire-resistive window or a Class D fire door.

SECTION 462

EXTERIOR REQUIREMENTS FOR COMMERCIAL BUILDINGS

Entrance to Commercial Buildings

Par. 4621. Entrances to Commercial Buildings shall be equal or greater in width than the required exits in which they are placed.

Projections From Commercial Buildings

Par. 4622. Marquees, signs, footings and other similar projections, on or of every Commercial Building projecting beyond the building lines into a street or other public way shall be in accordance with Chapter 21.

Loading Platforms on Commercial Buildings

Par. 4623. Fixed loading platforms of Commercial Buildings shall be so designed and located that no vehicle will occupy or encroach on the sidewalk or public driveway while loading or unloading from any such platform, except where permission is given by a special ordinance of the Mayor and City Council of Baltimore City.

SECTION 463

ROOF REQUIREMENTS FOR COMMERCIAL BUILDINGS

Scuttles and Bulkheads on Commercial Buildings

Par. 4635. Required scuttles in the roof of a Commercial Building shall be in accordance with Paragraph 4653.

Ventilators on Commercial Buildings

Par. 4636. Ventilators shall be required in the roof of every hazardous Commercial Building, and the total area of such vents shall be not less than one per cent of the gross floor area immediately below the roof.

Where the installation of ventilators in the roof is impracticable or in violation of other provisions of this Code, vents with a total area of not less than 2 per cent of the gross floor area immediately below the roof shall be placed in such locations which meet the approval of the Buildings Engineer.

Skylights, constructed as required in Paragraph 4637, may be substituted for ventilators in Commercial Buildings.

Skylights on Commercial Buildings

Par. 4637. Where skylights are used on Commercial Buildings instead of the ventilators required in Paragraph 4636, the total area of such skylights shall be at least 10 per cent of the gross floor area immediately below the roof and they shall be glazed with single thick plain glass.

For details of construction of skylights, refer to Section 766.

Roof Drainage on Commercial Buildings

Par. 4638. The roof surface of every Commercial Building shall be arranged so as to drain directly to gutters or leaders. Roofs having parapet walls which will impound water shall be provided with scuppers not less than 8 by 12 inches, one for each 1000 square feet of roof, or fraction thereof. No scuppers shall be placed in any parapet wall which is facing and is less than 5 feet from any adjoining property line.

Gutters and Downspouts on Commercial Buildings

Par. 4639. Gutters and leaders shall be provided on Commercial Buildings to properly conduct the water from the roofs thereof where necessary to prevent damage to any property. Water from any part of a Commercial Building shall not be allowed to fall or flow on a public footway, except from window sills, copings and cornices, not more than one foot wide and from awnings or marquees discharging off the outer edge.

SECTION 464

INTERIOR ARRANGEMENT OF COMMERCIAL BUILDINGS

Scope of Interior Arrangements of Commercial Buildings

Par. 4640. This Section includes the requirements for arranging and constructing of highly hazardous rooms, elevator lobbies, basements, furnace rooms, machinery rooms and toilet rooms, shafts, vertical openings and garages in Commercial Buildings.

Heights of Rooms in Commercial Buildings

Par. 4642. No minimum heights of rooms in Commercial Buildings are required.

Highly Hazardous Commercial Rooms

Par. 4643. Every room in which the materials or products listed in Paragraph 4743, and in the quantities stated therein, are kept or stored for sale or exchange and every room in which Class I or II liquids in any quantity are delivered into containers shall constitute a highly hazardous commercial room.

Such rooms shall not exceed 12,000 cubic feet in volume and shall be entirely enclosed by not lower than two-hour fire-resistive construction, with all openings in such enclosures protected by Class B fire doors. For exterior openings, see Paragraphs 4616 and 4619. Interior door openings of rooms where Class I or Class II liquids are kept or stored shall be provided with incombustible sills at least 6 inches high and a floor sloped to drain to a safe place.

Commercial buildings containing highly hazardous commercial rooms only shall be Type A, Fireproof, or Type B, Fire-resistant, buildings not over one story or 25 feet high, with all rooms enclosed as required in Paragraph 4643.

For the ventilation and fire extinguishing equipment of highly hazardous commercial rooms, refer to Paragraphs 4675 and 4671 respectively.

Elevator Lobbies in Commercial Buildings

Par. 4644. Lobbies or similar landing spaces for elevators permitted to be used as means of egress in all stories of Commercial Buildings, except the first, shall have an aggregate area of not less than 3 per cent of the gross floor area served.

The width of exits from passenger elevator lobbies in the first story shall be not less than one foot for every 50 square feet, or major fraction thereof, of elevator car area discharging into the lobby. The width of such exits shall be added to the width of other exits which they may join.

Elevator lobbies shall be enclosed as required for passageways in Part V.

Furnace and Machinery Rooms in Commercial Buildings

Par. 4646. Furnace rooms, power rooms and rooms for fuel storage in a Commercial Building shall be separated from the other portions of the building, including stairways, by fire-resistive construction of not lower than three-hour rating. All openings in such separations shall be protected by self-closing Class A fire doors or fixed fire-resistive windows.

No such rooms shall be located under any stairway or exit, or open directly into any stairway or other required exit from the building.

For required machinery rooms of refrigerating systems refer to Chapter 96.

Toilet Rooms in Commercial Buildings

Par. 4647. In Commercial Buildings, at least one toilet room shall be provided in every 20,000 square feet of floor area, or fraction thereof, located so that the maximum travel distance from any point to a toilet room shall not exceed 400 feet.

Where both sexes are employed, or occupy the building, not less than 2 separate toilet rooms shall be provided in such units of area, and shall be clearly marked "MEN" or "WOMEN".

No toilet rooms shall connect directly with any bakery, kitchen, dining room or other room where food or food products are prepared or handled.

Separate compartments shall be provided for each water closet where more than one water closet, or a water closet and a urinal or urinals are placed in the same toilet room.

Every room or compartment containing a water closet shall be not less than 33 inches wide and there shall be a clear space at least 18 inches wide directly in front of the water closet.

The floor finish in all toilet rooms shall be waterproof and non-absorbent. The walls and ceilings of all toilet rooms shall be smoothly finished.

Shafts and Vertical Openings in Commercial Buildings

Par. 4648. In Commercial Buildings all shafts shall be enclosed in all stories of Commercial Buildings except as herein noted.

Single openings in floors shall be enclosed in the story above or below, except as follows:

a. In retail stores, one stairway or escalator may be installed without enclosure for each 20,000 square feet of floor area, but such stairway or escalator shall not be considered a required means of egress and the floor opening shall be provided with a smoke apron extending 3 feet down from the ceiling.

b. Stairways piercing only one floor serving as required exits from one story shall be enclosed in the other story, but stairways serving only retail sales areas in basements need not be enclosed.

These regulations shall not be held to require the enclosure of ramps used for the movement of motor and other vehicles for handling freight if provided with water curtains in accordance with Chapter 98, which will serve as firestops between stores.

These regulations shall also not be held to require the enclosure of mezzanine floors nor of shafts or single openings in such floors only.

All enclosures shall be in accordance with the type requirements in Part V.

Garages in Commercial Buildings

Par. 4649. Garages more than 600 square feet in area or more than one story in height in or attached to Commercial Buildings shall be separated therefrom as required for hazardous storage occupancies in Section 407.

One story garages 600 square feet or less in area in or attached to Commercial Buildings shall be separated therefrom by not lower than two-hour fire-resistive construction, with only one opening, not over 25 square feet in area protected by a self-closing Class B fire door. Exterior openings serving such garages shall meet the requirements of Paragraph 4716 for larger garages.

SECTION 465

EXIT REQUIREMENTS FOR COMMERCIAL BUILDINGS

General Exit Requirements for Commercial Buildings

Par. 4650. Every Commercial building shall be provided with safe exits in accordance with the requirements of this Section. When unusually hazardous conditions or conditions not covered by this Code exist in Commercial Buildings, the Buildings Engineer shall order additional exit facilities to assure the safety of the occupants thereof.

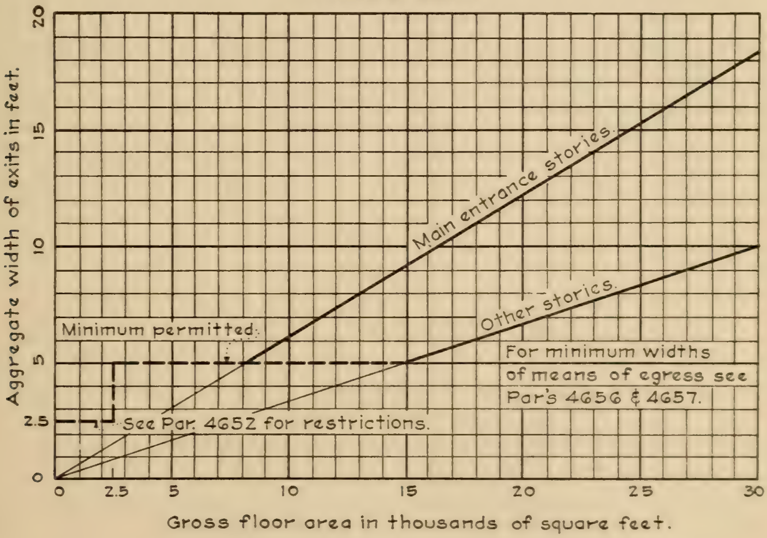
Mezzanine floor areas in Commercial Buildings, discharging on a floor shall be added to the area of that floor.

For exits from elevator lobbies, see Paragraph 4644.

Width of Exits in Commercial Buildings

Par. 4651. The aggregate width of exits from every floor area above the basement in Commercial Buildings shall not be less than that shown graphically on the following diagram. The width of each exit shall be not less than the total required width, divided by the number of exits, but never less than 30 inches, except where otherwise specifically permitted.

DIAGRAM 4651D



The required width of exits shall not be reduced in the direction of exit travel.

The exits from one story shall be permitted to be joined with the exits from the story immediately above without adding the width of such exits, but the number of exits, as required in the following Paragraphs, shall not be reduced.

Location and Number of Exits from Stories in Commercial Buildings

Par. 4652. Every story above the basement, or each fire division thereof, in Commercial Buildings, shall have at least two exits separated and as remote as possible from each other, except as noted below, but the location and number of exits shall be such that the distance a person must travel from any point to reach an exit from the story in the various types of buildings shall not exceed that given in Column 1 of the following table; however, the distance a person must travel from any point from which exits may be reached in one direction only, to a point from which exits may be reached in two basically different directions, shall not exceed that shown in Column 2.

TABLE 4652T

Type of building	Column 1	Column 2
Fireproof	200 feet	50 feet
Fire-resistant	150 "	40 "
Steel Frame	100 "	30 "
Slow Burning	75 "	30 "
Ordinary	60 "	20 "
Metal	60 "	20 "
Wood Frame	30 "	15 "

In cases where the minimum aggregate width of exits as required by Paragraph 4651 is not sufficient to provide the number of exits needed to satisfy the requirements of this Paragraph for maximum distance of travel to them, additional exits shall be provided and they shall be distributed as uniformly as possible. Not more than one-half of the required exits shall lead into the same lobby or passageway in a story above the first, after leaving the story

Not more than half of the required exits shall be permitted to empty into the same room in the first story and then only on condition that exit doorways from the first story are within 15 feet of such exits. All required exits shall be permitted to lead into the same lobby or passageway, with two remote exits, in the first story.

Stories above the basement, or fire divisions thereof, 2500 square feet or less in area, in Type A, Fireproof or Type B, Fire-resistant, buildings of any height; in Type C, Steel Frame, or Type D, Slow Burning, buildings not over 3 stories or 35 feet high; and in Type E, Ordinary, Type F, Metal, or Type G, Wood Frame, buildings not over 2 stories or 30 feet high, are not required to have more than one exit, which exit shall not lead through another fire division in the same story. In stories with one exit, the distance a person must travel from any point to the exit from that story, shall not exceed that shown in Column 2 of Table 4652T.

Every occupant of a story shall at all times have access to at least two remote exits from the story, except where only one exit is required.

Roof Exits in Commercial Buildings

Par. 4653. A flat roof intended to be occupied by persons shall be considered a room and a story, and exits shall be provided accordingly.

Access to flat roofs, on Commercial buildings ordinarily not occupied, shall be provided as follows:

a. From top stories 3000 square feet or less in area, one stairway, not less than 24 inches wide or a scuttle not less than 2 feet by 3 feet.

b. From top stories more than 3000 square feet but not over 6000 square feet in area, one stairway not less than 24 inches wide and another such stairway or a ladder remote from the first stairway.

c. From top stories over 6000 square feet in area, the two most remote stairways of the building shall be extended to the roof to form an exit not less than 24 inches wide.

Basement Exits in Commercial Buildings

Par. 4654. The exits from all basements, cellars, or fire divisions thereof, in Commercial buildings, shall be not less than 30 inches wide and at least one exit shall lead directly to a street or an open space leading to a street. Such areas shall have at least two exits as remote as possible from each other, in the following cases:

a. Where they are more than 1000 square feet in area.

b. Where they contain a commercial occupancy. The exits in such case shall be in accordance with the requirements in Paragraph 4651 for exits from main entrance stories and the requirements in Paragraph 4652.

Where two exits are required by Paragraph 4655 from furnace and power rooms which are located in the basement, at least one such exit shall lead directly to a street or to an open space leading to a street.

Every occupant of a basement shall at all times have access to at least two remote exits, except where only one exit is required.

Room Exits in Commercial Buildings

4655. The exits from every room or group of rooms in Commercial Buildings shall be at least 30 inches wide.

Every room or group of rooms, except as noted below, with an aggregate area of more than 2500 square feet and every kitchen serving a public dining room shall have at least two exits as remote from each other as possible.

Furnace rooms and power rooms shall have not less than two remote exits if they are more than 1600 square feet in area.

Storage and work rooms more than 1000 square feet in area shall have not less than two remote exits.

Exits from groups of rooms or separate rooms which are not a part of a group shall not lead through other rooms or groups of rooms, except that from separate rooms with two or more exits, one exit may lead through another room provided with the required exits.

Required Means of Egress in Commercial Buildings

Par. 4656. The required exits in Commercial buildings shall consist of one or more doorways, passageways, horizontal exits, interior stairways, fire towers or ramps, or any combination of them, except that in hazardous Commercial buildings more than 4 stories or 45 feet in height, a fire tower shall be placed in at least two remote exits. Such means of egress shall be as follows:

Doorways: The clear width of a single doorway or the aggregate clear width of a multiple doorway shall not be less than the required width of the exit in which it is placed.

Passageways: The clear width of a passageway shall not be less than the required width of the exit in which it is placed.

Horizontal Exits: The clear width of each means of egress forming a horizontal exit shall be at least equal to that of the required exit in which it is placed. There shall be one or more exits leading directly to a street from a story or fire division on each end of a horizontal exit, the aggregate width of which shall be equal to the width of the horizontal exit. The areas on each end of a horizontal exit shall be occupied by the same tenant, or passageways leading to the exits shall be continuously available to the different tenants of such areas.

Interior Stairways and Fire Towers: The width of such stairways, as defined in Paragraph 7722, in exits leading from stories or parts thereof, used for Commercial occupancy, shall be not less than one and two-thirds times the required width of such exits, as determined from the solid line in Diagram 4651D, but not less than 44 inches.

The width of such stairways in exits leading from rooms, basements and other stories or parts thereof, used for service and similar purposes only, shall be not less than the width of such exits.

No stairway serving upper stories shall be continued below the first floor level, unless they are enclosed in the basement and discharge into an enclosed means of egress leading directly to the street from the basement.

Ramps, except for motor vehicles, shall comply with all the requirements for stairways that are applicable.

Conditional Means of Egress in Commercial Buildings

Par. 4657. Conditional means of egress, constructed in accordance with Chapters 76 and 77, shall be permitted only to provide additional exits in existing Commercial Buildings with inadequate exits, or where, in such buildings hereafter erected, it is unreasonable or impracticable to construct required means of egress, but only upon the approval of the Buildings Engineer. Such means of egress shall be as follows:

Exterior Stairways: The width of exterior stairways shall be as required for interior stairways. Such stairways shall be permitted only where at least two required means of egress remote from each other are available from the story. Open exterior stairways shall not be permitted on buildings over 7 stories or 75 feet high.

Exterior Ramps shall comply with all the requirements for exterior stairways that are applicable.

Moving Stairs or Escalators which operate normally in the direction of exit travel may be substituted for an equal width of stairway or ramp but for not more than 15 per cent of the required aggregate width of exits. Escalators shall not be less than 36 inches wide.

Passenger Elevators may be given credit as exits by considering each unit of capacity of 35 persons per minute, from the highest loading area, equivalent to one foot of required exit width as determined from the solid line in Diagram 4551D, but not more than 25 per cent of such required exit width shall be substituted by elevators.

Standard Steel Fire Escapes may be permitted only on existing buildings.

Revolving Doors may be permitted at the rate of one revolving door to one foot of required exit width, as determined from the diagram in Paragraph 4651, except that Type B doors, as defined in Paragraph 7640, shall not be permitted to constitute more than 50 per cent of the width of each exit. Revolving doors shall not be placed within 10 feet of the foot of any stairway.

Spiral Stairs may be permitted only from a mezzanine floor not over 200 square feet in area.

Ladders may be permitted only in exits from furnace and power rooms in basements, and for access to roofs.

Emergency Means of Egress in Commercial Buildings

Par. 4658. In existing Commercial Buildings, where additional exits are required under the conditions stated in Paragraph 4650, and it is unreasonable or impracticable to construct required or conditional means of egress, emergency means of egress may be permitted or ordered by the Buildings Engineer.

Such means of egress are windows, sliding chutes, spiral stairs and ladders in locations other than those permitted in Paragraphs 4657, and poles.

Exit Signs in Commercial Buildings

Par. 4659. All exits in Commercial Buildings open to the public shall be indicated by signs at all times. Where exit signs are not visible from every point on a floor area, directional signs indicating the exits shall be provided. Directional signs shall also be placed along the line of exits.

For the requirements of exit and directional signs, refer to Paragraph 7892.

SECTION 466

OTHER INTERIOR ARRANGEMENTS FOR COMMERCIAL BUILDINGS

Scope of Other Interior Arrangements for Commercial Buildings

Par. 4660. This Section includes the requirements for aisles, transfer and shipping rooms, special service rooms and arcades in Commercial Buildings.

Aisles in Sales Rooms and Markets

Par. 4661. The minimum width of aisles in retail sales rooms and markets shall be 3 feet and in wholesale rooms shall be 2 feet at a point farthest away from the nearest exit. At all other points the width shall be not less than the minimum width plus one inch for every 5 feet of length measured in the direction of exit travel from the point of minimum width. All aisles shall lead to exits.

The width of aisles shall be measured from counter to counter unless there are fixed seats or other obstructions, in which case the measurements shall be taken from the obstructions, and no obstructions shall be permitted in the width called for.

Transfer and Shipping Rooms in Commercial Buildings

Par. 4662. All transfer and shipping rooms in a Commercial Building shall be separated from all other portions of the building by at least one-hour fire-resistive construction, and only accessible from such other portions through Class C fire doors. All loading, unloading and other spaces accessible to motor vehicles shall be separated from all other portions of the building by not lower than three-hour fire-resistive construction, and the openings therein shall be protected by Class B fire doors.

Door openings to rooms or buildings of hazardous Commercial occupancy shall be so arranged as to prevent the passage of motor vehicles through them.

Kitchens in Commercial Buildings

Par. 4666. In any Commercial Building, all kitchens serving public dining rooms or restaurants over 2000 square feet in area shall be separated therefrom by not lower than two-hour fire-resistive construction with all openings therein protected by self-closing Class C fire doors. Such kitchens shall be separated from all other portions of the building by not lower than one-hour fire-resistive construction with all openings therein protected by self-closing doors.

In any Commercial Building, all kitchens serving public dining rooms or restaurants 2000 square feet or less in area shall be separated therefrom and from all other portions of the building by not lower than one-hour fire-resistive construction, with all openings therein protected by self-closing doors.

Dressing Rooms in Commercial Buildings

Par. 4667. In Commercial Buildings, where it is necessary for employees to change clothing, separate dressing rooms shall be provided for males and females. Such dressing rooms shall be located as close to the toilet rooms as possible.

Adequate floor space shall be provided for the employees to be accommodated, but in no case shall a dressing room contain less than 30 square feet of floor area.

Arcades in Commercial Buildings

Par. 4668. Arcades in Commercial Buildings shall be open at both ends, and shall have a width of not less than 16 feet, and a clear height of not less than 20 feet. No loose furniture, merchandise, combustible decorations or other obstructions shall be permitted in arcades. No signs or other projections, or parts thereof, shall be permitted less than 8 feet above the pavement.

SECTION 467

ELECTRICAL AND MECHANICAL REQUIREMENTS FOR COMMERCIAL BUILDINGS

Scope of Electrical and Mechanical Requirements in Commercial Buildings

Par. 4670. This Section includes the requirements for fire extinguishing appliances, heating and ventilation, fire alarm, lighting, plumbing and other electrical and mechanical equipment for Commercial Buildings.

Fire Extinguishing Appliances in Commercial Buildings

Par. 4671. Automatic sprinklers shall be installed throughout in all stories, cellars and basements in every Commercial Building, as required in the following table, except that such sprinklers shall be installed in all highly hazardous commercial rooms included in Paragraph 4643, unless a foam or carbondioxide system is required by the Buildings Engineer in such rooms:

TABLE 4671T

Type of building	Hazardous	Moderately hazardous	Light hazardous
Fireproof	None, except under roofs of two-hour or less fire-resistive construction over hazardous rooms.	None, except under roofs of non-fire-resistive construction over moderately hazardous rooms.	None
Fire-resistant	Over 45 feet or 4 stories and under roofs of one-hour or less fire-resistive construction over hazardous rooms in other buildings.	None, except under roofs of non-fire-resistive construction over moderately hazardous rooms	None
Steel Frame	Over 40 feet or 3 stories	Over 60 feet or 5 stories*	None
Slow Burning	Over 30 feet or 2 stories	Over 60 feet or 5 stories*	None
Ordinary	Over 30 feet or 2 stories	Over 45 feet or 4 stories*	Over 45 feet or 4 stories*
Metal	All buildings	Over 35 feet or 3 stories*	Over 35 feet or 3 stories*
Wood Frame	All buildings	Over 30 feet or 2 stories*	Over 30 feet or 2 stories*

Note: *For existing buildings only

The sprinkler system in hazardous Commercial Buildings, and in highly hazardous commercial rooms shall be a Class C system, and in other commercial buildings a Class B system.

In rooms where the water from a sprinkler system will create a more hazardous condition than that already existing, the Buildings Engineer may permit the installation of another automatic fire extinguishing system instead of the required sprinklers.

Every Commercial Building 4 stories or 45 feet or less in height, shall be equipped with either a First Aid Standpipe system or portable fire extinguishers.

Every Commercial Building more than 4 stories or 45 feet but not exceeding 75 feet in height shall be equipped with a First Aid standpipe system.

Every Commercial Building which is more than 75 feet high shall be equipped with a Standard standpipe system.

Where standpipe systems are installed, in Commercial Buildings, there shall be at least one hose station in each story and basement in every 2500 square feet of floor area, or fraction thereof.

All Commercial Buildings more than 75 feet high shall be equipped with at least one hose outlet on the roof in every 2500 square feet of roof area, or fraction thereof.

Where portable fire extinguishers are provided in Commercial Buildings, there shall be at least one two-and-one-half gallon Class A portable extinguisher in each story and basement for every 2500 square feet of floor area or fraction thereof.

In rooms or spaces in Commercial Buildings where inflammable liquids are handled or stored, at least one two-and-one-half gallon Class B portable fire extinguisher shall be provided, unless a foam system is installed.

Fire Alarms in Commercial Buildings

Par. 4673. A Class II fire alarm system in accordance with Section 895 shall be installed in every Commercial Building more than 3 stories high which is lower than Type B, Fire-resistant, except in buildings which are provided with a complete automatic sprinkler system.

In addition to the required sending stations, at least one approved automatic detector which will sound the fire alarm in case of fire shall be placed at the following locations: (1) at the ceiling in front of furnaces, (2) at the head of stairs leading from basements and (3) near any source of great fire hazard.

Heating and Ventilation in Commercial Buildings

Par. 4675. Every Commercial Building shall be provided with a heating system capable of maintaining a temperature of at least 70 degrees Fahrenheit when the outside temperature is zero, in department and specialty stores, operating offices, restaurants, dressing, locker and toilet rooms. In rooms such as ware rooms, special mercantile rooms and rooms for hazardous merchandise, which require temperatures lower than that specified herein, such temperature shall be in accordance with the use of such rooms.

All rooms and other portions of Commercial Buildings normally used by human beings shall be provided with windows or skylights with an open area of at least one-sixteenth of the floor area or a gravity or mechanical ventilating system capable of providing one cubic foot of outdoor air per minute for every 10 square feet of floor area.

All highly hazardous Commercial rooms included in Paragraph 4643 shall be provided with means of ventilation as required by the National Fire Codes for Flammable Liquids and Gases, Edition 1938, published by the National Fire Protection Association.

Lighting in Commercial Buildings

Par. 4676. If a Commercial Building is intended to be occupied at times when natural light is inadequate or not available, it shall be provided with lighting facilities capable of furnishing artificial illumination of not less than 10 foot-candles at a plane 30 inches above the floor in all rooms, and not less than 3 foot-candles at the floors of all corridors, exits, toilet and service rooms.

Electrical Equipment in Commercial Buildings

Par. 4677. The construction and installation of all electrical appliances, equipment and wiring in Commercial Buildings, shall comply with the requirements of Part VIII.

Plumbing Requirements in Commercial Buildings

Par. 4678. Every Commercial Building shall be provided with plumbing equipment as follows:

At least one water closet for every 2000 square feet of gross floor area or fraction thereof, but there shall be at least two water closets in buildings used by both sexes. Two urinals may be substituted for one required water closet for males, but for not more than one-third of the required water closets.

One lavatory for every two water closets and for every four urinals, but at least one in each toilet room.

One sanitary drinking fountain in each story in each 6000 square feet of floor area or fraction thereof. Drinking fountains shall not be installed in toilet rooms.

SECTION 468

EXISTING COMMERCIAL BUILDINGS

General Requirements for Existing Commercial Buildings

Par. 4680. Commercial Buildings existing at the time this Code is adopted shall be permitted to continue if the requirements of Section 468 are complied with.

Non-Conforming Construction of Commercial Buildings

Par. 4681. When a Commercial Building, whose type or construction is not in conformity with the provisions of this Code, is altered or reconstructed in such a manner that the type or construction thereof is affected, any and all parts of such Commercial Building affected by the alteration or reconstruction shall be made to conform to all of the requirements of this Code for type and construction of new Commercial Buildings, or as near thereto as the Buildings Engineer may deem reasonable. Repairs on such Commercial Buildings are permitted without conforming to this Code.

Non-Conforming Arrangements of Commercial Buildings

Par. 4682. Non-conforming interior arrangements of existing Commercial Buildings shall be permitted to continue if they do not create a hazard to life. Whenever such interior arrangements are altered, the new arrangements shall conform as nearly as possible to those required for new buildings, but, in any case, the alterations shall create better or safer conditions.

Non-Conforming Heating Plants in Commercial Buildings

Par. 4683. Non-conforming heating plants in Commercial Buildings shall be made to conform to the requirements for new buildings upon notice from the Buildings Engineer, if they constitute a menace to the public safety or general welfare.

Non-Conforming Arrangement of Commercial Buildings

Par. 4684. Where, in an existing Commercial Building, the interior arrangement is not in conformity with the provisions of this Code, it shall be made to conform to the requirements of this Code for the interior arrangement in a new Commercial Building, if such non-conforming arrangement constitutes an imminent hazard to life or property.

However, when a Commercial Building is altered or reconstructed in such a manner that the interior arrangement thereof is changed, the new arrangement shall be made to conform as nearly as possible to the requirements of this Code for the interior arrangement in a new Commercial Building.

Non-Conforming Exits in Commercial Buildings

Par. 4685. Where, in an existing Commercial Building, the exits or means of egress are not in conformity with the provisions of this Code, they shall be made to conform to the requirements of this Code for exits and means of egress in new Commercial Buildings, if such non-conforming exits or means of egress are a hazard to life.

However, when a Commercial Building is altered or reconstructed in such a manner that the exits or means of egress therein are affected, or the means of egress therein are rennewed or altered, all such exits or such means of egress shall be made to conform to the requirements of this code for exits and means of egress in new Commercial Buildings.

Non-Conforming Fire Protection in Commercial Buildings

Par. 4686. Existing Commercial Buildings not provided with fire protection as required by this Code shall be equipped with such fire-extinguishing appliances and equipment so as to comply with the requirements for new Commercial Buildings, upon notice from the Buildings Engineer, where and as requested jointly by the Board of Fire Commissioners and the Buildings Engineer.

Non-Conforming Electrical and Mechanical Equipment in Commercial Buildings

Par. 4687. Where, in an existing Commercial Building, the electrical and mechanical equipment does not conform to the provisions of Part IV of this Code, such equipment shall be made to conform, except as hereinafter provided, to the requirements of Part IV of this Code for the electrical and mechanical equipment of new Commercial Buildings, if such non-conforming equipment or the absence of such equipment constitutes an imminent menace to life or health.

However, when such non-conforming electrical and mechanical equipment is altered, any and all parts of such equipment affected by the alteration, shall be made to conform to the requirements of this Code for electrical and mechanical equipment in new Commercial Buildings.

Non-Conforming Plumbing in Commercial Buildings

Par. 4688. Plumbing in existing Commercial Buildings not in accordance with the requirements of this Code shall be made to conform, upon notice from the Buildings Engineer, if they constitute a menace to the public safety or general welfare.

SECTION 469

MAINTENANCE AND OPERATION OF COMMERCIAL BUILDINGS

General Maintenance of Commercial Buildings

Par. 4691. Every Commercial Building and all parts thereof shall be kept in good repair and in safe condition while in use, or any other time when the lack of maintenance affects adjoining property; the roof and walls shall be kept so as not to leak; and all means of draining rain water therefrom shall be kept so as not to cause dampness in the walls, ceilings, or basements. All devices or safeguards which are required by this Code when the buildings are erected, altered or repaired shall be maintained in good working order.

All self-closing fire doors shall be kept normally closed. Automatic fire doors and their operating devices shall at all times be maintained in working order.

Exits, and other means of escape when permitted, shall be maintained at all times in good, safe, usable condition.

The enforcement of all fire prevention regulations shall be by the Fire Department.

The enforcement of all sanitary regulations shall be by the Health Department.

General Operation of Commercial Buildings

Par. 4692. The operation of Commercial Buildings shall be under the supervision of the Fire Department and the Health Department.

Maintenance and Operation of Fire Protection in Commercial Buildings

Par. 4694. The maintenance and operation of fire extinguishing appliances and equipment in Commercial Buildings shall be under the supervision of the Fire Department, who shall also enforce all regulations pertaining thereto. Refer to Chapter 98.

Maintenance and Operation of Heating and Ventilation in Commercial Buildings

Par. 4695. Refer to Part IX for regulations governing the maintenance of heating and ventilating equipment in Commercial Buildings. The operation of such equipment shall be under the supervision of the Health Department, who shall also enforce all regulations pertaining thereto.

Maintenance and Operation of Plumbing in Commercial Buildings

Par. 4696. The maintenance and operation of plumbing in Commercial Buildings shall be under the supervision of the Health Department, who shall also enforce all regulations pertaining thereto.

Maintenance and Operation of Other Electrical and Mechanical Equipment in Commercial Buildings

Par. 4697. All other electrical and mechanical equipment in Commercial Buildings, including all such equipment not specifically required by this Code, shall be maintained and operated so that, at all times, it will meet the requirements of this Code and will not constitute a life or fire hazard.

Posting Regulations in Commercial Buildings

Par. 4698. The live load for which each floor, or part of a floor, of a Commercial Building, is designed and approved, shall be conspicuously posted in that part of the story to which it applies.

CHAPTER 47

CLASS VII, STORAGE, BUILDINGS

Sec. 470—General Requirements for Storage Buildings.
Sec. 471—Size and Construction of Storage Buildings.
Sec. 472—Exterior Requirements for Storage Buildings.
Sec. 473—Roof Requirements for Storage Buildings.
Sec. 474—Interior Arrangement of Storage Buildings.
Sec. 475—Exit Requirements for Storage Buildings.
Sec. 476—Other Interior Arrangements for Storage Buildings.
Sec. 477—Electrical and Mechanical Requirements for Storage Buildings.
Sec. 478—Existing Storage Buildings.
Sec. 479—General Maintenance and Operation of Storage Buildings.

SECTION 470

GENERAL REQUIREMENTS FOR STORAGE BUILDINGS

Scope of Storage Buildings

Par. 4700. Storage Buildings shall include every building, or portion of a building, designed, constructed or used as a garage, storage building, warehouse, or as a place for storage, except as follows:

Units of light hazardous and moderately hazardous storage occupancy, in a story, having an aggregate area of less than 2000 square feet and less than 15 per cent of the floor area, which are in another occupancy, and incidental thereto, shall be considered to have the same occupancy as that in which they occur.

A garage not exceeding 600 square feet in area and not over one story in height which is part of a building shall not be considered a unit of storage occupancy. Such garages shall be constructed as required in the Paragraphs 4149, 4249, 4349, 4449, 4549, 4649, 4749 and 4849.

Isolated garages not exceeding 600 square feet in area shall be classed as accessory structures. Refer to Paragraph 4953.

References for Storage Buildings

Par. 4701. For applications, permits, certificates, inspections, violations, vacating, penalties and other administrative regulations, see Part I.

Classification of Storage Buildings

Par. 4703. Storage Buildings shall be classified in accordance with the degree of fire hazard created by their occupancy as follows:

Hazardous Storage Buildings shall include every building or portion thereof used for the storage or warehousing of:

Asphaltum
Barrels, second hand
Bags, second hand
Boxes, second hand
Broom corn
Calcium carbide
Combustible chemicals
Cotton in bales
Cork
Fertilizers
Gas, poisonous or irritating
Hay
Hydrofluoric acid
Lacquers
Motor vehicles, used
Motor vehicles, new, with fuel
Naval stores
Nitrate of soda
Nitric acid
Paints
Plant fibers, loose or baled
Petroleum products
Pyroxylin and pyroxylin plastic products
Rags
Salvaged merchandise
Second hand merchandise
Straw
Sulphuric acid
Tires
Varnish
Waste paper

and similar hazardous, highly combustible, flammable or explosive products or materials.

Moderately Hazardous Storage Buildings shall inclued every building or portion thereof used for the storage or warehousing of:

Freight, general
Furniture
Lumber
Millwork
Rugs
Sugar
Wallpaper
Whiskey in barrels

and similar moderately hazardous or not highly combustible or flammable products or materials.

Light Hazardous Storage Buildings shall include cold storage warehouses and similar buildings, and every building or portion thereof used for the storage or warehousing of:

Agricultural Implements
Bottled goods
Bottles in cartons
Canned goods
Cement
Ceramics
Coffee
Dental supplies
Dairy products
Electrical goods and Equipment
Flour
Groceries
Hardware
Hides
Ice
Jars in cartons
Leather goods
Machinery
Metal
Paper in bulk, new
Plumbers' supplies
Soap
Spices
Tea
Tin cans
Wood pulp in bales
Wool in bales or bags

and similar light hazardous, incombustible or non-explosive products or materials.

Storage Tanks for Liquids

Par. 4704. Tanks for the storage of liquids are considered to be mechanical construction, and shall be in accordance with Chapter 97.

Storage Bins for Grain and Coal

Par. 4705. Storage bins for grain, coal, and similar materials shall be in accordance with Section 493.

Unusual Conditions in Storage Buildings

Par. 4707. In new or existing Storage Buildings, where unusual conditions not specifically regulated by this Code create a fire hazard or a health menace, the Buildings Engineer shall require such additional construction, equipment or facilities as may be necessary for the protection of life or health.

Density of Population in Storage Buildings

Par. 4708. The normal population of a Storage Building shall average not more than one person to each 200 square feet of the area of all floors in the building.

Converting Into Storage Buildings

Par. 4709. No building of any other class of occupancy shall be converted into a Storage Building unless the building complies with all the requirements of this Code for new Storage Buildings.

SECTION 471

SIZE AND CONSTRUCTION OF STORAGE BUILDINGS

General Construction Requirements for Storage Buildings

Par. 4710 The construction of Storage Buildings shall be in accordance with the type requirements in Part V and also with the requirements of this Section.

Height and Volume Restrictions for Storage Buildings

Par. 4711. The height and volume of Storage Buildings shall be within the limits fixed by the following table, except as further restricted below:

TABLE 4711T

Type of building	Height		Maximum volume in cubic feet
	Feet	Stories	
Fireproof	Not hereby limited		Not hereby limited
Fire-resistant	80	7	1,200,000
Steel Frame	60	5	700,000
Slow Burning	60	5	700.000
Ordinary	45	4	500,000
Metal	40	3	350,000
Wood Frame	30	2	150,000

Type G, Wod Frame or Type F, Metal, buildings shall not be used for hazardous Storage Buildings, except as permitted in Part III.

Hazardous Storage Buildings constructed less than 100 feet from a Public Assembly Building, Private Assembly Building, Dwelling or Institution shall be Type A, Fireproof, buildings.

Where a Storage Building exceeds in volume the limits set in Table 4711T, it shall be divided into fire divisions by separations constructed as required in Sections 598 and 599, so that the volume of each such fire division will be within such limits.

For requirements of airplane hangars, refer to Paragraph 4906.

Special Requirements for Exterior Openings in Hazardous Storage Buildings

Par. 4716. In hazardous Storage Buildings or units, every exterior window opening which faces any adjoining property line or any opposite alley line and is less than 20 feet from said property line or alley line, shall be protected by a fire-resistive window, except that when such window opening is less than 10 feet from said property line or alley line, it shall be further protected by fixed sash.

The distance from any door, window or other opening in the exterior walls of a hazardous Storage Building, or unit, to any window or other opening in the exterior wall of another building or unit of occupancy shall meet the requirements of Paragraphs 4119, 4219, 4319, 4419, 4519, 4619, 4719 and 4819.

Every window opening in the exterior wall of a hazardous Storage Building, or unit, which opening is less than 10 feet from any exterior opening serving another occupancy, shall be protected by a fixed fire-resistive window.

No exterior woodwork of any kind shall be placed less than 20 feet above the top, or less than 5 feet from the sides, of any exterior door, exceeding 45 square feet in area, leading directly into a hazardous Storage occupancy.

Special Requirements for Exterior Openings in Moderately and Light Hazardous Storage Buildings

Par. 4719. In moderately hazardous or light hazardous Storage Buildings, or units, every exterior window opening which faces any adjoining property line or any opposite alley line and is less than 20 feet from said property line or alley line, shall be protected by a fire-resistive window.

The distance from any window or other opening in the exterior wall of a moderately hazardous or a light hazardous Storage Building, or unit, to any door, with an area exceeding 45 square feet, leading directly into a garage, or into a unit of hazardous Commercial, Storage or Industrial occupancy, shall meet the following requirements:

a. Such distance above the top, or the level of the top for a distance of 5 feet beyond the sides, of said door shall be not less than 10 feet and such distance from any side of said door shall be not less than 5 feet.

b. When such distance above the top, or the level of the top for a distance of 10 feet beyond the sides, of said door is less than 20 feet and such distance from any side of said door is less than 10 feet, the said window or other opening shall be protected by a fixed fire-resistive window or a Class D fire door.

Whenever the distance from any said window or other opening to any door with an area of 45 square feet or less or any window or other opening in the exterior wall of a garage or a hazardous Commercial, Storage or Industrial Building, or unit, is less than 5 feet at any side or less than 10 feet below the bottom of said window or other opening, the said window or other opening shall be protected by a fixed fire-resistive window or a Class D fire door.

SECTION 472

EXTERIOR REQUIREMENTS FOR STORAGE BUILDINGS

Entrances to Storage Buildings

Par. 4721. Entrances to Storage Buildings shall not be less in width than that of the required exits in which they are placed.

Projections From Storage Buildings

Par. 4722. Marquees, signs, footings and other similar projections on or of every Storage Building projecting beyond the building lines into a street or other public way shall be in accordance with Chapter 21.

Loading Platforms on Storage Buildings

Par. 4723. Fixed loading platforms of Storage Buildings shall be so designed and located that no vehicle will occupy or encroach on a sidewalk or public driveway while loading or unloading from such a platform, except where permission is given by an ordinance of the Mayor and City Council of Baltimore.

SECTION 473

ROOF REQUIREMENTS FOR STORAGE BUILDINGS

Scuttles and Bulkheads on Storage Buildings

Par. 4735. Required scuttles in the roof of Storage Buildings shall be in accordance with Paragraph 4753.

Ventilators on Storage Buildings

Par. 4736. Ventilators shall be required in the roof of every hazardous Storage Building, and the total area of such vents shall be not less than one-half of one per cent of the gross floor area immediately below the roof.

Where the installation of ventilators in the roof is impracticable or in violation of other provisions of this Code, vents with a total area of not less than one per cent of the gross floor area immediately below the roof shall be placed in such locations which meet the approval of the Buildings Engineer.

Skylights, constructed as required in Paragraph 4737, may be substituted for ventilators in Storage Buildings.

Skylights on Storage Buildings

Par. 4737. Where skylights are used on Storage Buildings instead of the ventilators required in Paragraph 4736, the total area of such skylights shall be at least 5 per cent of the gross floor area immediately below the roof and they shall be glazed with plain, single-thick glass.

For details of construction of skylights, refer to Section 766.

Roof Drainage on Storage Buildings

Par. 4738. The roof surface of every Storage Building shall be arranged so as to drain directly to gutters or leaders. Roofs having parapet walls which will impound water shall be provided with scuppers not less than 8 by 12 inches, one for each 1000 square feet of roof, or fraction thereof. No scuppers shall be placed in any parapet wall which is facing and is less than 5 feet from any adjoining property line.

Gutters and Downspouts on Storage Buildings

Par. 4739. Gutters and leaders shall be provided on Storage Buildings to conduct the water from the roofs thereof where necessary to prevent damage to any property. Water from any part of a Storage Building shall not be allowed to fall or flow on a public footway, except from window sills, copings and cornices, not more than one foot wide and from awnings or marquees discharging off the outer edge.

SECTION 474

INTERIOR ARRANGEMENT OF STORAGE BUILDINGS

Scope of Interior Arrangement of Storage Buildings

Par. 4740. This Section includes the arranging and constructing of highly hazardous storage rooms, elevator lobbies, basements, furnace rooms, machinery rooms and toilet rooms, shafts, vertical openings, garages and the subdivision of upper floors in Storage Buildings.

Subdivision of Upper Floors in Storage Buildings

Par. 4741. The floors above the first story in Type E, Ordinary, hazardous Storage Buildings shall be subdivided into areas not exceeding 5000 square feet by not lower than two-hour fire-resistive construction with all openings therein protected by Class B fire doors or fixed fire-resistive windows.

Heights of Rooms in Storage Buildings

Par. 4742. No minimum heights of rooms in Storage Buildings are required.

Highly Hazardous Storage Rooms

Par. 4743. Every room used for the storage of the following materials or products in the quantities stated shall constitute a highly hazardous storage room:

Calcium Carbide—when the weight of calcuim carbide exceeds 600 pounds.

Cellulose Nitrate Film—when cellulose nitrate motion-picture film exceeds 200 standard reels or cellulose nitrate photographic or X-ray film exceeds 50 cubic feet in volume.

Flammable Liquids—Class I or Class II liquids in portable containers when the quantity exceeds 50 gallons in the aggregate.

Pyroxylin Plastic—when the weight of raw pyroxylin plastic material exceeds 1,000 pounds.

Other materials or products, other than explosives, in quantities to be fixed by the Buildings Engineer, that are liable to cause fires by self-ignition through friction, through absorption of moisture or through spontaneous chemical changes.

Such rooms shall not exceed 12,000 cubic feet in volume and shall be entirely enclosed by not lower than two-hour fire-resistive construction, with all openings in such enclosures protected by Class B fire doors. For exterior openings, see Paragraphs 4716 and 4719. Interior door openings of rooms where Class I or Class II liquids are stored shall be provided with incombustible sills at least 6 inches high and a floor sloped to drain to a safe place.

Storage Buildings containing highly hazardous storage rooms only shall be Type A, Fireproof, or Type B, Fire-resistant, buildings not over one story or 25 feet high, with all rooms enclosed as required in Paragraph 4743.

For the ventilation and fire extinguishing equipment of highly hazardous storage rooms, refer to Paragraphs 4775 and 4771, respectively.

Elevator Lobbies in Storage Buildings

Par. 4744. Elevator lobbies or similar landing spaces permitted to be used as means of egress in Storage Buildings shall be enclosed as required for passageways in Part V.

Furnace and Machinery Rooms in Storage Buildings

Par. 4746. Furnace rooms, power rooms and rooms for fuel storage in a hazardous or in a moderately hazardous Storage Building, shall be separated from the other portions of the building, including stairways, by fire-resistive construction of not lower than three-hour rating. All openings in such enclosures shall be protected by self-closing Class A fire doors or fire-resistive windows.

No such rooms shall be located under any stairway or exit or open directly into any stairway or other required exit from the building.

For required machinery rooms of refrigerating systems, refer to Chapter 96.

Toilet Rooms in Storage Buildings

Par. 4747. In Storage Buildings, at least one toilet room shall be provided in every 100,000 square feet of floor area or fraction thereof. Where both sexes are employed, at least two separate toilet rooms shall be provided in such units of area, and shall be clearly marked "MEN" or "WOMEN".

No toilet rooms shall connect directly to any room where unprotected food products are stored or handled.

Separate compartments shall be provided for each water closet where more than one water closet or a water closet and a urinal or urinals are placed in the same toilet room.

Every room or compartment containing a water closet shall be not less than 33 inches wide and there shall be a clear space at least 18 inches wide directly in front of the water closet.

The floor finish in all toilet rooms shall be waterproof and non-absorbent. The walls and ceilings of all toilet rooms shall be smoothly finished.

Shafts and Vertical Openings in Storage Buildings

Par. 4748. In Storage Buildings all shafts shall be enclosed and all single openings shall be enclosed in the story above or below, except as herein noted.

Stairways piercing only one floor serving as required exits from one story shall be enclosed in the other story.

Ramps used for the movement of motor and other vehicles need not be enclosed if provided with water curtains, in accordance with Chapter 98, which will serve as firestops between stories.

Mezzanine floors shall be enclosed if the total area of the floor and mezzanines in one story or a division thereof by fire-resistive walls exceeds the maximum area of the building derived from the limitations given in the table in Paragraph 4711. Shafts and vertical openings shall be enclosed, as herein provided for other floors, in mezzanines that are required to be enclosed.

All enclosures shall be in accordance with the type requirements in Part V.

Garages in Storage Buildings

Par. 4749. Garages more than 600 square feet in area or more than one story in height in or attached to Storage Buildings shall be separated therefrom as required for hazardous storage occupancies in Section 407.

One story garages 600 square feet or less in area in or attached to Storage Buildings shall be separated therefrom by not lower than two-hour fire-resistive construction, with only one opening, not over 25 square feet in area protected by a self-closing Class B fire door. Exterior openings serving such garages shall meet the requirements of Paragraph 4716 for larger garages.

SECTION 475

EXIT REQUIREMENTS FOR STORAGE BUILDINGS

General Exit Requirements for Storage Buildings

Par. 4750. Every Storage Building shall be provided with safe exits in accordance with the requirements of this Section. When unusually hazardous conditions or conditions not covered by this Code exist in any Storage Building, the Buildings Engineer shall order additional exit facilities to assure the safety of the occupants thereof.

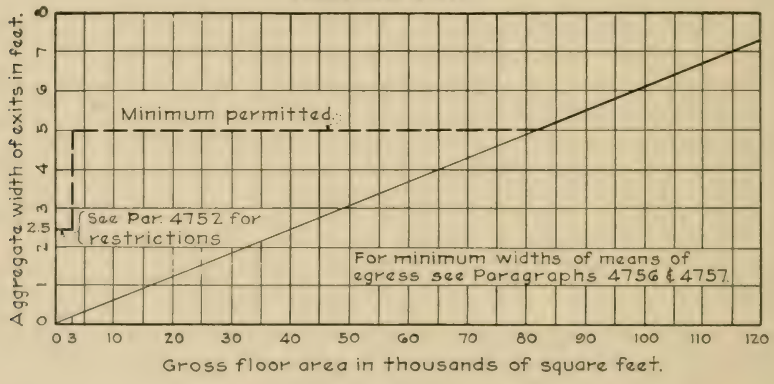
Mezzanine floor areas in Storage Buildings discharging on a floor shall be added to the area of that floor.

Width of Exits in Storage Buildings

Par. 4751. The aggregate width of exits from every floor area above the basement in Storage Buildings shall not be less than that shown graphically on the following diagram.

The width of each exit shall not be less than the total required width divided by the number of exits, but never less than 30 inches, except where otherwise specifically permitted.

DIAGRAM 4751D



The required width of exits shall not be reduced in the direction of exit travel.

The exits from one story shall be permitted to be joined with the exits from the story immediately above without adding the width of such exits, but the number of exits, as required in the following Paragraphs, shall not be reduced.

Location and Number of Exits from Stories in Storage Buildings

Par. 4752. Every story above the basement, or each fire division thereof, in Storage Buildings, shall have at least two exits separated and as remote as possible from each other, except as noted below, but the location and number of exits shall be such that the distance a person must travel from any point to reach an exit from the story in the various types of buildings shall not exceed that given in Column 1 of the following table; however, the distance a person must travel from any point from which exits may be reached in one direction only, to a point from which exits may be reached in two basically different directions, shall not exceed that shown in Column 2.

TABLE 4752T

Type of building	Column 1	Column 2
Fireproof	300 feet	75 feet
Fire-resistant	200 "	50 "
Steel Frame	150 "	40 "
Slow Burning	100 "	30 "
Ordinary	75 "	20 "
Metal	75 "	20 "
Wood Frame	50 "	20 "

In cases where the minimum aggregate width of exits as required by Paragraph 4751 is not sufficient to provide the number of exits needed to satisfy the requirements of this Paragraph for maximum distance of travel to them, additional exits shall be provided and they shall be distributed as uniformly as possible. Not more than one-half the required exits shall lead into the same passageway after leaving the story.

Stories above the basement, or fire divisions thereof, 3000 square feet or less in area, in Type A, Fireproof, or Type B, Fire-resistant, buildings of any height; in Type C, Steel Frame, or Type D, Slow Burning, buildings not over 3 stories or 40 feet high, and in Type E, Ordinary, Type F, Metal, or Type G, Wood Frame, buildings not over 2 stories or 30 feet high, are not required to have more than one exit, which exit shall not lead through another fire division in the same story. In stories with one exit, the distance a person must travel from any point to the exit from that story shall not exceed that shown in Column 2 of Table 4752T.

Every occupant of a story shall at all times have access to at least two remote exits from the story, except where only one exit is required.

Roof Exits in Storage Buildings

Par. 4753. A flat roof intended to be occupied by persons shall be considered a room and a story, and exits shall be provided accordingly.

Access to flat roofs, on Storage Buildings, ordinarily not occupied, shall be provided as follows:

a. From top stories 3000 square feet or less in area, one stairway not less than 24 inches wide or a scuttle not less than 2 feet by 3 feet.

b. From top stories more than 3000 square feet but not over 6000 square feet in area, one stairway not less than 24 inches wide and another such stairway or a ladder remote from the first stairway.

c. From top stories over 6000 square feet in area, the two most remote stairways of the building shall be extended to the roof to form an exit not less than 24 inches wide.

Basement Exits in Storage Buildings

Par. 4754. The exits from all basements, cellars, or fire divisions thereof, in Storage Buildings shall be not less than 30 inches wide and at least one exit shall lead directly to a street or an open space leading to a street. Such areas shall have at least two exits, as remote as possible from each other, in the following cases:

a. Where they are more than 1000 square feet in area.

b. Where they contain storage occupancy. The exits in such case shall be in accordance with Paragraphs 4751 and 4752.

Where two exits are required by Paragraph 4755 from furnace and power rooms which are located in the basement, at least one such exit shall lead directly to a street or to an open space leading to a street.

Every occupant of a basement shall at all times have access to at least two remote exits, except where only one exit is required.

Room Exits from Storage Buildings

Par. 4755. The exits from every room or group of rooms in Storage Buildings shall be at least 30 inches wide.

Every room or group of rooms, except as noted below, with an aggregate area of more than 3000 square feet, shall have at least two exits as remote from each other as possible.

Furnace rooms and power rooms shall have not less than two remote exits, if they are more than 1600 square feet in area.

Exits from groups of rooms or separate rooms which are not part of a group shall not lead through other rooms or groups of rooms, except that from separate rooms with two or more exits, one exit may lead through another room provided with the required exits.

Required Means of Egress in Storage Buildings

Par. 4756. The required exits in Storage Buildings shall consist of one or more doorways, passageways, horizontal exits, interior stairways, fire towers or ramps, or any combination of them, except that in hazardous Storage Buildings more than 4 stories or 45 feet in height, a fire tower shall be placed in at least two remote exits. Such means of egress shall be as follows:

Doorways: The clear width of a single doorway or the aggregate clear width of a multiple doorway shall not be less than the required width of the exit in which it is placed.

Passageways: The clear width of a passageway shall not be less than the required width of the exit in which it is placed.

Horizontal Exits: The clear width of each means of egress forming a horizontal exit shall be at least equal to that of the required exit in which it is placed. There shall be one or more exits leading directly to a street from a story or fire division on each end of a horizontal exit, the aggregate width of which shall be at least equal to the width of the horizontal exit. The areas on each end of a horizontal exit shall be occupied by the same tenant or passageways leading to the exits shall be continuously available to the different tenants of such areas.

Interior Stairways and Fire Towers: The width of such stairways, as defined in Paragraph 7722, in exits from stories or parts thereof used for storage occupancy shall be not less than one and two-thirds times the required width of such exits, as determined from the solid line in Diagram 4751D, but not less than 36 inches.

The width of such stairways in exits from rooms, basements and other stories or parts thereof used for service and similar purposes only shall be not less than the width of such exits.

No stairway serving upper stories shall be continued below the first floor level, unless they are enclosed in the basement and discharge into an enclosed means of egress leading directly to the street from the basement.

Ramps, except for motor vehicles, shall comply with all the requirements for stairways that are applicable.

Conditional Means of Egress in Storage Buildings

Par. 4757. Conditional means of egress, constructed in accordance with Chapters 76 and 77, shall be permitted only to provide additional exits in existing Storage Buildings with inadequate exits, or where, in such buildings hereafter erected, it is unreasonable or impracticable to construct required means of egress, but only upon the approval of the Buildings Engineer. Such means of egress shall be as follows:

Exterior Stairways: The width of exterior stairways shall be as required for interior stairways. Such stairways shall be permitted only where at least two required means of egress remote from each other are available from the story or tier. Open exterior stairways shall not be permitted on buildings over 7 stories or 75 feet high.

Exterior Ramps shall comply with all the requirements for exterior stairways that are applicable.

Standard Steel Fire Escapes may be permitted only on existing buildings.

Passenger Elevators may be given credit as exits by considering each unit of capacity of 35 persons per minute, from the highest loading area, equivalent to one foot of required exit width as determined from the solid line in Diagram 4751D, but not more than 25 per cent of such required exit width shall be substituted by elevators.

Sliding Chutes may be considered equal to 44 inches of stairway width, but chutes shall not be substituted for more than 25 per cent of the required width of all stairways from the area served.

Spiral Stairways may be permitted only from a mezzanine floor not over 200 square feet in area.

Ladders may be permitted only in exits from furnace and machinery rooms in basements, and for access to roofs.

Emergency Means of Egress in Storage Buildings

Par. 4758. In existing Storage Buildings, where additional exits are required under the conditions stated in Paragraph 4750, and it is unreasonable or impracticable to construct required or conditional means of egress, emergency means of egress may be permitted or ordered by the Buildings Engineer.

Such means of egress are windows, sliding chutes, spiral stairs and ladders in locations other than those permitted in Paragraph 4757, and poles.

Exit Signs in Storage Buildings

Par. 4759. All exits in Storage Buildings shall be indicated by suitable signs and where exit signs are not visible from every point on a floor area, directional signs indicating the exit shall be provided. Directional signs shall also be placed along the line of exits.

For the requirements of exit and directional signs, refer to Paragraph 7892.

SECTION 476

OTHER INTERIOR ARRANGEMENTS FOR STORAGE BUILDINGS

Scope of Other Interior Arrangements for Storage Buildings

Par. 4760. This Section includes the requirements for aisles, transfer and shipping rooms, and special service rooms in Storage Buildings.

Aisles in Storage Rooms

Par. 4761. Aisles not less than 2 feet wide leading to exits shall be provided along the whole length of the exterior walls in all storage rooms.

Transfer Rooms in Storage Buildings

Par. 4762. In Storage Buildings loading and unloading, and other spaces accessible to motor vehicles, shall be entirely separated from all hazardous storage rooms by not lower than three-hour fire-resistive construction, with the openings therein protected by Class B fire doors.

Loading and unloading spaces in light hazardous or in moderately hazardous Storage Buildings or rooms need not be separated.

Door openings to rooms or buildings of hazardous storage occupancy shall be so arranged as to prevent the passage of motor vehicles through them.

Special Service Rooms in Storage Buildings

Par. 4767. *Dressing Rooms:* In Storage Buildings, where it is necessary for employees to change clothing, separate dressing rooms shall be provided for males and females. Such dressing rooms shall be located as close to the toilet rooms as possible.

Adequate floor space shall be provided for the employees to be accommodated, but in no case shall a dressing room contain less than 30 square feet of floor area.

Work Rooms: Work rooms in a Storage Building shall be separated from the rest of the building by at least one-hour fire-resistive construction.

SECTION 477

ELECTRICAL AND MECHANICAL REQUIREMENTS FOR STORAGE BUILDINGS

Scope of Electrical and Mechanical Requirements In Storage Buildings

Par. 4770. This Section includes the requirements for fire extinguishing appliances, heating and ventilation, fire alarm, lighting, plumbing and other electrical and mechanical equipment for Storage Buildings.

Fire Extinguishing Appliances in Storage Buildings

Par. 4771. Automatic sprinklers shall be installed throughout in all stories, cellars and basements in Storage Buildings, as required in the following Table, except that such sprinklers shall be installed in all highly hazardous storage rooms included in Paragraph 4743, unless a foam or carbondioxide system is required by the Buildings Engineer in such rooms:

TABLE 4771T

Type of building	Hazardous	Moderately hazardous	Light hazardous
Fireproof	None, except under roofs of two-hour or less fire-resistive construction over hazardous rooms	None, except under roofs of non-fire-resistive construction over moderately hazardous rooms	None
Fire-resistant	Over 50 feet or 4 stories and under roofs of one-hour or less fire-resistive construction over hazardous rooms in other buildings	None, except under roofs of non-fire-re sistive construction over moderately hazardous rooms	None
Steel Frame	Over 40 feet or 3 stories	Over 45 feet or 4 stories	None
Slow Burning	Over 30 feet or 2 stories	Over 45 feet or 4 stories	None
Ordinary	All buildings	Over 40 feet or 3 stories	Over 45 feet or 4 stories*
Metal	All buildings	Over 40 feet or 3 stories*	Over 40 feet or 3 stories*
Wood Frame	All buildings	Over 30 feet or 2 stories*	Over 30 feet or 2 stories*

Note: *For existing buildings only.

The sprinkler system in hazardous storage buildings and in highly hazardous storage rooms shall be a Class C system, and in other Storage Buildings a Class B system.

In rooms where the water from a sprinkler system will create a more hazardous condition than that already existing, the Buildings Engineer may permit, the installation of another automatic fire extinguishing system instead of the required sprinklers.

Every Storage Building 4 stories or 45 feet or less in height, shall be equipped with either a First Aid standpipe system or portable fire extinguishers.

Every Storage Building more than 4 stories or 45 feet but not exceeding 75 feet in height shall be equipped with a First Aid standpipe system.

Every Storage Building which is more than 75 feet high shall be equipped with a Standard standpipe system.

Where standpipe systems are installed, there shall be at least one hose station in each story and basement in every 10,000 square feet of floor area, or fraction thereof.

All Storage Buildings more than 75 feet high shall be equipped with at least one hose outlet on the roof in every 10,000 square feet of roof area, or fraction thereof.

Where portable fire extinguishers are provided in Storage Buildings, there shall be at least one two-and-one-half gallon Class A portable extinguisher in each story and basement for every 2000 square feet of floor area, or fraction thereof.

In rooms and spaces of Storage Buildings in which inflammable liquids are stored, at least one two-and-one-half gallon Class B portable fire extinguisher shall be provided, unless a foam system is installed.

Fire Alarm in Storage Buildings

Par. 4773. No fire alarm system is required in any Storage Building.

Heating and Ventilation in Storage Buildings

Par. 4775. Rooms in Storage Buildings ordinarily intended for human occupancy, such as operating offices, dressing, locker and toilet rooms, shall be provided with a heating system capable of maintaining a temperature of at least 70 degrees Fahrenheit when the outside temperature is zero.

Such rooms shall be provided with windows or skylights with an open area of at least one-sixteenth of the floor area, or a gravity or mechanical ventilating system capable of providing one cubic foot of outdoor air per minute for every 20 square feet of floor area.

All highly hazardous storage rooms included in Paragraph 4743 shall be provided with means of ventilation as required by the National Fire Codes for Flammable Liquids and Gases, Edition 1938, published by the National Fire Protection Association.

In garages classed as storage occupancy in Paragraph 4700, a vapor removal system shall be provided capable of removing the lowest 12-inch thick layer of air at least 4 times an hour, unless sufficient openings are provided at the floor level and at the bottom of elevator pits, stairwells and other low areas, to permit a natural escape of the gases and vapors.

Lighting in Storage Buildings

Par. 4776. If a Storage Building is intended to be occupied at times when natural light is inadequate or not available, it shall be provided with lighting facilities capable of furnishing 3 foot-candles at the floor of all corridors, exits, toilet rooms and service rooms, and 8 foot-candles at the floor in all rooms normally occupied by human beings, except in storage rooms.

Electrical Equipment in Storage Buildings

Par. 4777. The construction and installation of all electrical appliances, equipment and wiring in Storage Buildings shall comply with the requirements of Part VIII.

Plumbing Requirements in Storage Buildings

Par. 4778. Every Storage Building shall be provided with at least one water closet, one lavatory and one sanitary drinking fountain for each 50,000 square feet of floor area, or fraction thereof. Where both sexes are employed, there shall be at least two water closets. Drinking fountains shall not be placed in toilet rooms.

SECTION 478

EXISTING STORAGE BUILDINGS

General Requirements for Existing Storage Buildings

Par. 4780. Storage Buildings existing at the time this Code is adopted shall be permitted to continue if the requirements of Section 478 are complied with.

Non-Conforming Construction of Storage Buildings

Par. 4781. When a Storage Building, whose type or construction is not in conformity with the provisions of this Code, is altered or reconstructed in such a manner that the type or construction thereof is affected, any and all parts of such Storage Building affected by the alteration or reconstruction shall be made to conform to all of the requirements of this Code for type and construction of new Storage Buildings, or as near thereto as the Buildings Engineer may deem reasonable. Repairs on such Storage Buildings are permitted without conforming to this Code.

Non-Conforming Arrangements of Storage Buildings

Par. 4782. Non-conforming interior arrangements of existing Storage Buildings shall be permitted to continue if they do not create a hazard to life. Whenever such interior arrangements are altered, the new arrangements shall conform as nearly as possible to those required for new buildings, but, in any case, the alterations shall create better or safer conditions.

Non-Conforming Heating Plants in Storage Buildings

Par. 4783. Non-conforming heating plants in Storage Buildings shall be made to conform to the requirements for new buildings, upon notice from the Buildings Engineer, if they constitute a menace to the public safety or general welfare.

Non-Conforming Arrangement of Storage Buildings

Par. 4784. Where, in an existing Storage Building, the interior arrangement is not in conformity with the provisions of this Code, it shall be made to conform to the requirements of this Code for the interior arrangement in a new Storage Building, if such non-conforming arrangement constitutes an imminent hazard to life or property.

However, when a Storage Building is altered or reconstructed in such a manner that the interior arrangement thereof is changed, the new arrangement shall be made to conform as nearly as possible to the requirements of this Code for the interior arrangement in a new Storage Building.

Non-Conforming Exits in Storage Buildings

Par. 4785. Where, in an existing Storage Building, the exits or means of egress are not in conformity with the provisions of this Code, they shall be made to conform to the requirements of this Code for exits and means of egress in new Storage Buildings, if such non-conforming exits or means of egress are a hazard to life.

However, when a Storage Building is altered or reconstructed in such a manner that the exits or means of egress therein are affected, or the means of egress therein are renewed or altered, all such exits or such means of egress shall be made to conform to the requirements of this Code for exits and means of egress in new Storage Buildings.

Non-Conforming Fire Protection in Storage Buildings

Par. 4786. Existing Storage Buildings not provided with fire protection as required by this Code shall be equipped with such fire extinguishing appliances and equipment so as to comply with the requirements for new Storage Buildings.

Non-Conforming Electrical and Mechanical Equipment in Storage Buildings

Par. 4787. Where, in an existing Storage Building, the electrical and mechanical equipment does not conform to the provisions of Part IV of this Code, such equipment shall be made to conform, except as hereinafter provided, to the requirements of Part IV of this Code for the electrical and mechanical equipment of new Storage Buildings, if such non-conforming equipment or the absence of such equipment constitutes an imminent menace to life or health.

However, when such non-conforming electrical and mechanical equipment is altered, any and all parts of such equipment affected by the alteration, shall be made to conform to the requirements of this Code for electrical and mechanical equipment in new Storage Buildings.

Non-Conforming Plumbing in Storage Buildings

Par. 4788. Plumbing in existing Storage Buildings not in accordance with the requirements of this Code shall be made to conform, upon notice from the Buildings Engineer, if they constitute a menace to the public safety or general welfare.

SECTION 479

MAINTENANCE AND OPERATION OF STORAGE BUILDINGS

General Maintenance of Storage Buildings

Par. 4791. Every Storage Building and all parts thereof shall be kept in good repair and in a safe condition while in use, or any other time when the lack of maintenance affects adjoining property; the roof and walls shall be kept so as not to leak; and all means of draining rain water therefrom shall be kept so as not to cause dampness in the walls, ceilings, or basements. All devices or safeguards which are required by this Code when the buildings are erected, altered, or repaired shall be maintained in good working order.

All self-closing fire doors shall be kept normally closed. Automatic fire doors and their operating devices shall at all times be maintained in working order.

Exits and other means of escape when permitted, shall be maintained at all times in good, safe, usable condition.

The enforcement of all fire prevention regulations shall be by the Fire Department.

The enforcement of all sanitary regulations shall be by the Health Department.

General Operation of Storage Buildings

Par. 4792. The operation of Storage Buildings shall be under the supervision of the Fire Department and the Health Department.

Maintenance and Operation of Fire Protection in Storage Buildings

Par. 4794. The maintenance and operation of fire extinguishing appliances and equipment in Storage Buildings shall be under the supervision of the Fire Department, who shall also enforce all regulations pertaining thereto. Refer to Chapter 98.

Maintenance and Operation of Heating and Ventilation in Storage Buildings

Par. 4795. Refer to Part IX for regulations governing the maintenance of heating and ventilating equipment in Storage Buildings. The operation of such equipment shall be under the supervision of the Health Department, who shall also enforce all regulations pertaining thereto.

Maintenance and Operation of Plumbing in Storage Buildings

Par. 4796. The maintenance and operation of plumbing in Storage Buildings shal be under the supervision of the Health Department, who shall also enforce all regulations pertaining thereto.

Maintenance and Operation of Other Electrical and Mechanical Equipment in Storage Buildings

Par. 4797. All other electrical and mechanical equipment in Storage Buildings, including all such equipment not specifically required by this Code, shall be maintained and operated so that, at all times, it will meet the requirements of this Code and will not constitute a life or fire hazard.

Posting Regulations in Storage Buildings

Par. 4798. In every Storage Building where materials, goods or products are intended to be piled, notices of a permanent character shall be painted or otherwise prominently displayed, stating the live load which the floor is designed to carry. Such notices shall be placed in full view on each floor.

CHAPTER 48

CLASS VIII, INDUSTRIAL, BUILDINGS

Sec. 480—General Requirements for Industrial Buildings
Sec. 481—Size and Construction of Industrial Buildings
Sec. 482—Exterior Requirements for Industrial Buildings.
Sec. 483—Roof Requirements for Industrial Buildings.
Sec. 484—Interior Arrangement of Industrial Buildings.
Sec. 485—Exit Requirements for Industrial Buildings.
Sec. 486—Other Interior Arrangements for Industrial Buildings.
Sec. 487—Electrical and Mechanical Requirements for Industrial Buildings.
Sec. 488—Existing Industrial Buildings.
Sec. 489—Maintenance and Operation of Industrial Buildings.

SECTION 480

GENERAL REQUIREMENTS FOR INDUSTRIAL BUILDINGS

Scope of Industrial Buildings

Par. 4800. Industrial Buildings shall include every building, or portion of a building, designed, constructed or used as a factory, assembly plant, processing plant, foundry, planing mill, rolling mill, or as a place of industrial activity.

Units of light hazardous and moderately hazardous industrial occupancy, in a story, having an aggregate area of less than 2000 square feet and less than 15 per cent of the floor area, which are in another occupancy, and incidental thereto, shall be considered to have the same occupancy as that in which they occur.

References for Industrial Buildings

Par. 4801. For applications, permits, certificates, inspections, violations, vacating, penalties and other administrative regulations, see Part I.

Classification of Industrial Buildings

Par. 4803. Industrial Buildings shall be classified in accordance with the degree of fire hazard created by their occupancy, as follows:

Hazardous Industrial Buildings shall include spray painting shops, dry cleaning establishments using flammable liquids with a flash point of 100 degrees Fahrenheit or less, drying kilns and similar buildings, and every building or portion thereof used for the manufacturing, assembling or processing of:

Acetylene gas
Brooms
Chemicals; irritating or poisonous
Cork
Cotton batts or wadding
Drugs
Fertilizers
Flour
Fuel gas
Gas; irritating or poisonous
Grain or seed (cleaning or grinding)
Lacquer
Mattresses
Matches
Paint
Petroleum products
Pyroxylin or pyroxylin plastic products
Re-treading (rubber tires)
Spices or vegetable stocks
Varnish
Vegetable fiber products
Wood products

and similar hazardous, highly combustible, flammable or explosive products or materials.

Moderately Hazardous Industrial Buildings shall include bakeries, laundries and establishments for coffee, cocoa, peanut and cereal roasting, lard rendering, meat smoking, printing, lithographing on tin, electrotyping, whiskey distilling and rectifying, dry cleaning establishments using flammable liquids with a flash point of over 100 degrees Fahrenheit, and similar buildings, and every other building or portion thereof used for the manufacturing, assembling or processing of:

Baggage
Bags; burlap, cotton or paper
Clothing
Containers; paper or pasteboard
Envelopes
Flavoring extracts
Perfume
Shoes
Textiles
Wearing apparel

and similar moderately hazardous or not highly combustible or flammable products or materials.

Light Hazardous Industrial Buildings shall include abattoirs and meatpacking plants, breweries, bottling establishments, dairies, machinery and motor vehicle assembly plants and similar buildings, and every building or portion thereof used for the manufacturing, assembly or processing of:

Beverages
Brass, copper or iron
Canned goods
Cement blocks
Cigars or cigarettes
Electrical goods or equipment
Hardware
Ice cream
Ice
Jewelry
Lead or solder
Silver goods
Soap
Tinplate or tin cans
Vinegar
Yeast

and similar light hazardous, incombustible or non-explosive products or materials.

Unusual Conditions in Industrial Buildings

Par. 4807. In new or existing Industrial Buildings, where unusual conditions not specifically regulated by this Code create a fire hazard or a health menace, the Buildings Engineer shall require such additional construction, equipment or facilities as may be necessary for the protection of life or property.

Density of Population in Industrial Buildings

Par. 4808. The normal population of an Industrial Building shall average not more than one person to each 60 square feet of the area of all floors in the building.

Converting Into Industrial Buildings

Par. 4809. No building of any other class of occupancy shall be converted into an Industrial Building unless the building complies with all the requirements of this Code for new Industrial Buildings.

SECTION 481

SIZE AND CONSTRUCTION OF INDUSTRIAL BUILDINGS

General Construction Requirements for Industrial Buildings

Par. 4810. The construction of Industrial Buildings shall be in accordance with the type requirements in Part V and also with the requirements of this Section.

Height and Volume Restrictions for Industrial Buildings

Par. 4811. The height and volume of Industrial Buildings shall be within the limits fixed by the following table, except as required below:

TABLE 4811T

Type of building	Height		Maximum volume in cubic feet
	Feet	Stories	
Fireproof	Not hereby limited		Not hereby limited
Fire-resistant	80	7	1,200,000
Steel Frame	60	5	700,000
Slow Burning	60	5	700,000
Ordinary	45	4	500,000
Metal	40	3	350,000
Wood Frame	30	2	150,000

Light hazardous Industrial Type B, Fire-resistant, or Type C, Steel Frame, or Type F, Metal buildings, not over one story or 30 feet in height shall not be limited in volume.

Type G, Wood Frame or Type F, Metal, buildings shall not be used for hazardous Industrial Buildings, except as permitted in Part III.

Hazardous Industrial Buildings constructed less than 100 feet from a Public Assembly Building, Private Assembly Building, Dwelling or Institution, shall be Type A, Fireproof, buildings.

Where an Industrial Building exceeds in volume the limits set in Table 4811T, it shall be divided into fire divisions by separations constructed as required in Sections 598 and 599, so that the volume of each such fire division will be within such limits.

Special Requirements for Exterior Openings in Hazardous Industrial Buildings

Par. 4816. In hazardous Industrial Buildings or units, every exterior window opening which faces any adjoining property line or any opposite alley line and is less than 20 feet from said property line or alley line, shall be protected by a fire-resistive window, except that when such window opening is less than 10 feet from said property line or alley line, it shall be further protected by fixed sash.

The distance from any door, window or other opening in the exterior walls of a hazardous Industrial Building, or unit, to any window or other opening in the exterior wall of another building or unit of occupancy shall meet the requirements of Paragraphs 4119, 4219, 4319, 4419, 4519, 4619, 4719 and 4819.

Every window opening in the exterior wall of a hazardous Industrial Building, or unit, which opening is less than 10 feet from any exterior opening serving another occupancy, shall be protected by a fixed fire-resistive window.

No exterior woodwork of any kind shall be placed less than 20 feet above the top, or less than 5 feet from the sides, of any exterior door, exceeding 45 square feet in area, leading directly into a hazardous Industrial occupancy.

Special Requirements for Exterior Openings in Moderately and Light Hazardous Industrial Buildings

Par. 4819. In moderately hazardous or light hazardous Industrial Buildings, or units, every exterior window opening which faces any adjoining property line or any opposite alley line and is less than 20 feet from said property line or alley line, shall be protected by a fire-resistive window.

The distance from any window or other opening in the exterior wall of a moderately hazardous or a light hazardous Industrial Building, or unit, to any door, with an area exceeding 45 square feet, leading directly into a garage, or into a unit of hazardous Commercial, Storage or Industrial occupancy, shall meet the following requirements:

a. Such distance above the top, or the level of the top for a distance of 5 feet beyond the sides, of said door shall be not less than 10 feet and such distance from any side of said door shall be not less than 5 feet.

b. When such distance above the top, or the level of the top for a distance of 10 feet beyond the sides, of said door is less than 20 feet and such distance from any side of said door is less than 10 feet, the said window or other opening shall be protected by a fixed fire-resistive window or a Class D fire door.

Whenever the distance from any said window or other opening to any door with an area of 45 square feet or less or any window or other opening in the exterior wall of a garage or a hazardous Commercial, Storage or Industrial Building or unit is less than 5 feet at any side or less than 10 feet below the bottom of said window or other opening, the said window or other opening shall be protected by a fixed fire-resistive window or a Class D fire door.

SECTION 482

EXTERIOR REQUIREMENTS FOR INDUSTRIAL BUILDINGS

Entrances to Industrial Buildings

Par. 4821. Entrances to Industrial Buildings shall not be less in width than that of the required exits in which they are placed.

Projections from Industrial Buildings

Par. 4822. Marquees, signs, footings and other similar projections, on or of every Industrial Building projecting beyond the building lines into a street or other public way shall be in accordance with Chapter 21.

Loading Platforms on Industrial Buildings

Par. 4823. Fixed loading platforms of Industrial Buildings shall be so designed and located that no vehicle will occupy or encroach on the sidewalk or public driveway while loading or unloading from any such platform, except where permission is given by an ordinance of the Mayor and City Council of Baltimore.

SECTION 483

ROOF REQUIREMENTS FOR INDUSTRIAL BUILDINGS

Scuttles and Bulkheads on Industrial Buildings

Par. 4835. Required scuttles in the roof of an Industrial Building shall be in accordance with Paragraph 4853.

Ventilators on Industrial Buildings

Par. 4836. Ventilators shall be required in the roof of every hazardous Industrial Building, and the total area of such vents shall be not less than one per cent of the gross floor area immediately below the roof.

Where the installation of ventilators in the roof is impracticable or in violation of other provisions of this Code, vents with a total area of not less than 2 per cent of the gross floor area immediately below the roof shall be placed in such locations which meet the approval of the Buildings Engineer.

Skylights, constructed as required in Paragraph 4637, may be substituted for ventilators in Commercial Buildings.

Skylights on Industrial Buildings

Par. 4837. Where skylights are used on Industrial Buildings instead of the ventilators required in Paragraph 4836, the total area of such skylights shall be at least 10 per cent of the gross floor area immediately below the roof, and they shall be glazed with plain, single-thick glass.

For details of construction of skylights, refer to Section 766.

Roof Drainage on Industrial Buildings

Par. 4838. The roof surface of every Industrial Building shall be arranged so as to drain directly to gutters or leaders. Roofs having parapet walls which will impound water shall be provided with scuppers not less than 8 by 12 inches, one for each 1000 square feet of roof, or fraction thereof. No scuppers shall be placed in any parapet wall which is facing and is less than 5 feet from any adjoining property line.

Gutters and Downspouts on Industrial Buildings

Par. 4839. Gutters and leaders shall be provided on Industrial Buildings to property conduct the water from the roof where necessary to prevent damage to any property. Water from any part of Industrial Buildings shall not be allowed to fall or flow on a public footway, except from window sills, copings and cornices, not more than one foot wide and from awnings or marquees discharging off the outer edge.

SECTION 484

INTERIOR ARRANGEMENT OF INDUSTRIAL BUILDINGS

Scope of Interior Arrangement of Industrial Buildings

Par. 4840. This section includes the arranging and constructing of highly hazardous manufacturing rooms, elevator lobbies, basements, furnace rooms, machinery rooms and toilet rooms, shafts, vertical openings and garages in Industrial Buildings.

Heights of Rooms in Industrial Buildings

Par. 4842. No minimum heights of rooms in Industrial Buildings are required.

Highly Hazardous Industrial Rooms

Par. 4843. Every room in which stationary acetylene generators are placed; in which paints, varnishes or lacquers are mixed, compounded or manufactured; in which painting, varnishing or japaning is done by spraying, dipping, drying or baking, except spraying performed in booths; in which Class I or Class II liquids in portable containers and in quantities exceeding 50 gallons in the aggregate are handled or used; or in which other similar highly hazardous industrial operation or activity is performed, shall constitute a highly hazardous industrial room.

Such rooms shall be entirely enclosed by not lower than two-hour fire-resistive construction and all openings in such enclosures shall be protected by Class B fire doors. For exterior openings, see Paragraph 4816 and 4819. Interior door openings of highly hazardous industrial rooms were Class I or Class II liquids are handled shall be provided with incombustible sills at least 6 inches high and a floor sloped to drain to a safe place.

Industrial Buildings containing highly hazardous industrial rooms only shall be Type A, Fireproof, or Type B, Fire-resistant, buildings not over one story or 25 feet high, with all rooms enclosed as required in Paragraph 4843.

For the ventilation and fire-extinguishing equipment of highly hazardous industrial rooms, refer to Paragraphs 4875 and 4871, respectively.

Elevator Lobbies in Industrial Buildings

Par. 4844. Lobbies or similar landing spaces for elevators permitted to be used as means of egress in all stories of

Industrial Buildings, except the first, shall have an aggregate area of not less than 2 per cent of the gross floor area served.

The width of exits from passenger elevator lobbies in the first story shall be not less than one foot for every 50 square feet, or major fraction thereof, of elevator car area discharging into the lobby. The width of such exits shall be added to the width of other exits which they may join.

Elevator lobbies shall be enclosed as required for passageways in Part V.

Furnace and Machinery Rooms in Industrial Buildings

Par. 4846. Furnace rooms in a hazardous Industrial Building shall be separated from the other portions of the building by fire-resistive construction of not lower than three-hour rating. All openings in such separations shall be protected by self-closing Class A fire doors or fire-resistive windows. Furnace rooms in a moderately hazardous Industrial Building shall be separated likewise if they tend to increase the hazard.

Furnace and fuel rooms shall not be located under any stairway or exit and shall not open directly into any stairway or other required exit from the building.

For required machinery rooms of refrigerating systems, refer to Chapter 96.

Toilet Rooms in Industrial Buildings

Par. 4847. In Industrial Buildings, at least one toilet room shall be provided in every 40,000 square feet of floor area, or fraction thereof, located so that the maximum distance from any point to a toilet room shall not exceed 800 feet. Nothing herein shall prevent the placing of toilet rooms in separate buildings, on the condition that the maximum distance permitted is not exceeded.

Where both sexes are employed, at least two separate toilet rooms shall be provided in such units of area and shall be clearly marked "MEN" or "WOMEN".

No toilet rooms shall connect directly with any bakery, kitchen, dining room or other room where food or food products are prepared or handled.

Separate compartments shall be provided for each water closet, where more than one water closet or a water closet and a urinal or urinals are placed in the same toilet room.

Every room or compartment containing a water closet shall be not less than 33 inches wide and there shall be a clear space at least 18 inches wide directly in front of the water closet.

The floor finish in all toilet rooms shall be waterproof and non-absorbent. The walls and ceilings of all toilet rooms shall be smoothly finished.

Shafts and Vertical Openings in Industrial Buildings

Par. 4848. In Industrial Buildings all shafts shall be enclosed and all single openings shall be enclosed in the story above or below, except as herein noted.

Stairways piercing only one floor serving as required exits from one story shall be enclosed in the other story.

Ramps used for the movement of motor and other vehicles need not be enclosed if provided with water curtains, in accordance with Chapter 98, which will serve as firestops between stories.

Mezzanine floors shall be enclosed if the total area of the floor and mezzanines in one story or a division thereof by fire-resistive walls exceeds the maximum area of the building derived from the limitations given in the table in Paragraph 4811. Shafts and vertical openings shall be enclosed, as herein provided for other floors, in mezzanines that are required to be enclosed.

All enclosures shall be in accordance with the type requirements in Part V.

Where the manufacturing process requires shafts and vertical openings peculiar to such process, the Buildings Engineer may accept other types of enclosure than those required and may omit enclosures if they unduly hamper the operation of machinery. In all such cases the Buildings Engineer may require such types of construction and such special safeguards as may appear necessary for safety.

Garages in Industrial Buildings

Par. 4849. Garages more than 600 square feet in area or more than one story in height in or attached to Industrial Buildings shall be separated therefrom as required for hazardous storage occupancies in Section 407.

One-story garages 600 square feet or less in area in or attached to Industrial Buildings shall be separated therefrom by not lower than two-hour fire-resistive construction, with only one opening, not over 25 square feet in area protected by a self-closing Class B fire door. Exterior openings serving such garages shall meet the requirements of Paragraph 4716 for larger garages.

SECTION 485

EXIT REQUIREMENTS FOR INDUSTRIAL BUILDINGS

General Exit Requirements for Industrial Buildings

Par. 4850. Every Industrial Building shall be provided with safe and unobstructed exits in accordance with the requirements of this Section. When unusually hazardous conditions or conditions not covered by this Code in any Industrial Building, the Buildings Engineer shall order additional exit facilitis to assure the safety of the occupants thereof.

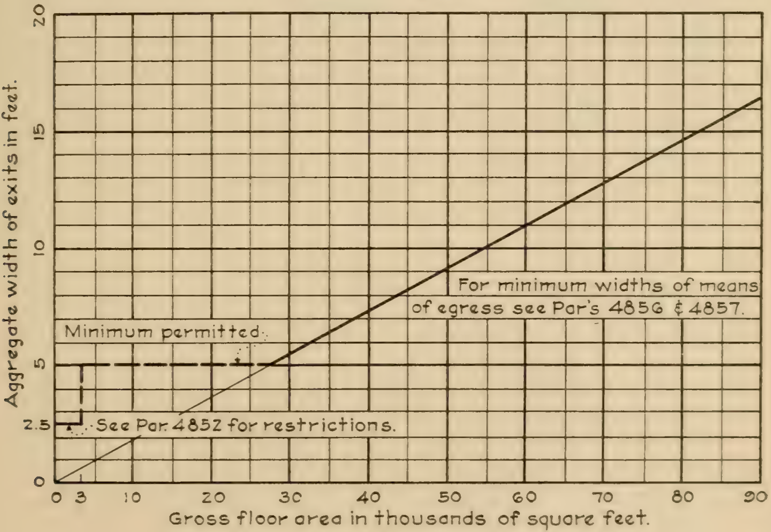
Mezzanine floor areas in Industrial Buildings discharging on a floor shall be added to the area of that floor.

For exits from elevator lobbies, see Paragraph 4844.

Width of Exits in Industrial Buildings

Par. 4851. The aggregate width of exits from every floor area above the basement in Industrial Buildings shall not be less than that shown graphically on the following diagram. The width of each exit shall be not less than the total required width divided by the number of exits, but never less than 30 inches except where otherwise specifically permitted.

DIAGRAM 4851D



The required width of exits shall not be reduced in the direction of exit travel.

The exits from one story shall be permitted to be joined with the exits from the story immediately above without adding the width of such exits, but the number of exits, as required in the following Paragraphs, shall not be reduced.

Location and Number of Exits from Stories in Industrial Buildings

Par. 4852. Every story above the basement, or each fire division thereof, in Industrial Buildings shall have at least two exits separated and as remote as possible from each other, except as noted below, but the location and number of exits shall be such that the distance a person must travel from any point to reach an exit from the story in the various types of buildings shall not exceed that given in Column 1 of the following table; however, the distance a person must travel from any point from which exits may be reached in one direction only, to a point from which exits may be reached in two basically different directions, shall not exceed that shown in Column 2.

TABLE 4852T

Type of building	Column 1	Column 2
Fireproof	200 feet	50 feet
Fire-resistant	200 “	50 “
Steel Frame	150 “	40 “
Slow Burning	150 “	40 “
Ordinary	75 “	30 “
Metal	50 “	20 “
Wood Frame	30 “	20 “

In cases where the minimum aggregate width of exits as required by Paragraph 4851 is not sufficient to provide the number of exits needed to satisfy the requirements of this Paragraph for maximum distance of travel to them, additional exits shall be provided, and they shall be distributed as uniformly as possible. Not more than one-half the required exits shall empty into the same passageway after leaving the story.

Stories above the basement, or fire divisions thereof, 3000 square feet or less in area, in Type A, Fireproof, or Type B, Fire-resistant, buildings of any height, in Type C, Steel Frame, or Type D, Slow Burning, buildings not over 3 stories or 40 feet high, and in Type E, Ordinary, Type F, Metal, or Type G, Wood Frame, buildings not over 2 stories or 30 feet high, are not required to have more than one exit, which exit shall not lead through another fire division in the same story. In stories with one exit, the distance a person must travel from any point to the exit from that story shall not exceed that shown in Column 2 of Table 4852T.

Every occupant of a story shall at all times have access to at least two remote exits from the story, except where only one exit is required.

Roof Exits in Industrial Buildings

Par. 4853. A flat roof intended to be occupied by persons shall be considered a room and a story, and exits shall be provided accordingly.

Access to flat roofs on Industrial Buildings, ordinarily not occupied, shall be provided as follows:

a. From top stories 3000 square feet or less in area, one stairway not less than 24 inches wide or a scuttle not less than 2 feet by 3 feet.

b. From top stories more than 3000 square feet but not over 6000 square feet in area, one stairway not less than 24 inches wide and another such stairway or a ladder remote from the first stairway.

c. From top stories over 6000 square feet in area, the two most remote stairways of the buildings shall be extended to the roof to form an exit not less than 24 inches wide.

Basement Exits from Industrial Buildings

Par. 4854. The exits from all basements, cellars, or fire divisions thereof, in Industrial Buildings, shall be not less than 30 inches wide and at least one exit shall lead directly to a street or an open space leading to a street. Such areas shall have at least two exits, as remote as possible from each other, in the following cases:

a. Where they are more than 1000 square feet in area.

b. Where they contain an industrial occupancy. The exits in such case shall be in accordance with Paragraphs 4851 and 4852.

Where two exits are required by Paragraph 4855 from furnace rooms, which are located in the basement, at least one such exit shall lead directly to a street or to an open space leading to a street.

Every occupant of a basement shall at all times have access to at least two remote exits, except where only one exit is required.

Room Exits from Industrial Buildings

Par. 4855. The exits from every room or group of rooms in Industrial Buildings shall be at least 30 inches wide.

Every room or group of rooms with an aggregate area of more than 3000 square feet, shall have at least two exits as remote from each other as possible.

Exits from groups of rooms or separate rooms which are not a part of a group shall not lead through other rooms or groups of rooms, except that from separate rooms with two or more exits, one exit may lead through another room provided with the required exits.

Required Means of Egress in Industrial Buildings

Par. 4856. The required exits in Industrial Buildings shall consist of one or more doorways, passageways, horizontal exits, interior stairways, fire towers, or ramps, or any combination of them, except that in hazardous Industrial Buildings more than 4 stories or 45 feet in height, a fire tower shall be placed in at least two remote exits. Such means of egress shall be as follows:

Doorways: The clear width of a single doorway or the aggregate clear width of a multiple doorway shall not be less than the required width of the exit in which it is placed.

Passageways: The clear width of a pasageway shall not be less than the required width of the exit in which it is placed.

Horizontal Exits: The clear width of each means of egress forming a horizontal exit shall be at least equal to that of the required exit in which it is placed. There shall be one or more exits leading directly to a street, from a story or fire division on each end of a horizontal exit, the aggregate width of which shall be at least equal to the width of the horizontal exit. The areas on each end of a horizontal exit shall be occupied by the same tenant or passageways leading to the exits shall be continuously available to the different tenants of such areas.

Interior Stairways and Fire Towers: The width of such stairways as defined in Paragraph 7722, in exits from stories or parts thereof used for Industrial occupancy, shall be not less than one and two-thirds times the required width of such exits, as determined from the solid line in diagram 4851D, but not less than 44 inches.

The width of such stairways in exits from rooms, basements and other stories or parts thereof used for services and similar purposes only shall be not less than the width of such exits.

No stairway serving upper stories shall be continued below the first floor level, unless they are enclosed in the basement and discharge into an enclosed means of egress leading directly to the street from the basement.

Ramps, except for motor vehicles, shall comply with all the requirements for stairways that are applicable.

Conditional Means of Egress in Industrial Buildings

Par. 4857. Conditional means of egress, constructed in accordance with Chapters 76 and 77, shall be permitted only to provide additional exits in existing Industrial Buildings with inadequate exits, or where, in such buildings hereafter erected, it is unreasonable or impracticable to construct required means of egress, but only upon the approval of the Buildings Engineer. Such means of egress shall be as follows:

Exterior Stairways: The width of exterior stairways shall be as required for interior stairways. Such stairways shall be permitted only where at least two required means of egress remote from each other are available from the story or tier. Open exterior stairways shall not be permitted on buildings over 7 stories or 75 feet high.

Exterior Ramps shall comply with all the requirements for exterior stairways that are applicable.

Standard Steel Fire Escapes may be permitted only on existing buildings.

Passenger Elevators may be given credit as exits by considering each unit of capacity of 35 persons per minute, from the highest loading area, equivalent to one foot of required exit width as determined from the solid line in Diagram 4851D, but not more than 25 per cent of such required exit width shall be substituted by elevators.

Spiral Stairs may be permitted only from a mezzanine floor not over 200 square feet in area.

Ladders may be permitted only in exits from furnace rooms in basements and for access to roofs.

Emergency Means of Egress in Industrial Buildings

Par. 4858. In existing Industrial Buildings, where additional exits are required under the conditions stated in Paragraph 4850, and it is unreasonable or impracticable to construct required or conditional means of egress, emergency means of egress may be permitted or ordered by the Buildings Engineer.

Such means of egress are windows, sliding chutes, spiral stairs and ladders in locations other than those permitted in Paragraph 4857, and poles.

Exit Signs in Industrial Buildings

Par. 4859. All exits in Industrial Buildings shall be indicated by suitable signs at all times. Where exit signs are not visible from every point on a floor area, directional signs indicating the exit shall be provided. Directional signs shall also be placed along the line of exits.

For the requirements of exit and directional signs, refer to Paragraph 7892.

SECTION 486

OTHER INTERIOR ARRANGEMENTS FOR INDUSTRIAL BUILDINGS

Scope of Other Interior Arrangements for Industrial Buildings

Par. 4860. This Section includes the requirements for aisles, transfer and shipping rooms, and special service rooms in Industrial Buildings.

Aisles in Manufacturing Rooms

Par. 4861. The minimum width of aisles in manufacturing rooms shall be 2 feet at a point farthest away from the nearest exit. At all other points the width shall be not less than the minimum width plus one inch for every 5 feet of length measured in the direction of exit travel from the point of minimum width.

All aisles shall lead to exits.

Spaces for Loading in Industrial Buildings

Par. 4862. In Industrial Buildings loading and unloading spaces and other spaces accessible to motor vehicles shall be entirely separated from all rooms of hazardous industrial occupancy by not lower than three-hour fire-resistive construction with the openings therein protected by Class B fire doors.

Such spaces in light hazardous or in moderately hazardous buildings need not be separated.

Door openings to rooms or buildings of hazardous industrial occupancy shall be so arranged as to prevent the passage of motor vehicles through them.

Drying Rooms in Dry Cleaning Establishments

Par. 4864. In dry cleaning establishments in which flammable liquids are used, the drying rooms shall be separated from the cleaning rooms by four-hour fire-resistive construction. All openings in such construction shall be protected by Class A fire doors.

For the protection of exterior openings in such rooms, see Paragraph 4819.

Kitchens in Industrial Buildings

Par. 4866. In any Industrial Building Kitchens serving public dining rooms or restaurants over 2000 square feet in area shall be separated therefrom by not lower than two-hour fire-resistive construction with all openings therein protected by self-closing Class C fire doors. Such kitchens shall be separated from all other portions of the building by not lower than one-hour fire-resistive construction with all openings therein protected by self-closing doors.

In any Industrial Building Kitchens serving public dining rooms or restaurants 2000 square feet or less in area shall be separated therefrom and from all other portions of the building by not lower than one-hour fire-resistive construction with all openings therein protected by self-closing doors.

Dressing Rooms in Industrial Buildings

Par. 4867. In Industrial Buildings, where it is necessary for employees to change clothing, separate dressing rooms shall be provided for males and females. Such dressing rooms shall be located as close to the toilet rooms as possible.

Adequate floor space shall be provided for the employees to be accommodated, and in no case shall a dressing room contain less than 30 square feet of floor area.

SECTION 487

ELECTRICAL AND MECHANICAL REQUIREMENTS FOR INDUSTRIAL BUILDINGS

Scope of Electrical and Mechanical Requirements in Industrial Buildings

Par. 4870. This Section includes the requirements for fire extinguishing appliances, heating and ventilation, fire alarm, lighting, plumbing and other electrical and mechanical equipment for Industrial Buildings.

Fire Extinguishing Appliances in Industrial Buildings

Par. 4871. Automatic sprinklers shall be installed throughout in all stories, cellars and basements in Industrial Buildings, as required in the following table, except that such sprinklers shall be installed in all highly hazardous industrial rooms included in Paragraph 4843, unless a foam or carbon-dioxide system is required by the Buildings Engineer in such rooms:

TABLE 4871T

Type of building	Hazardous	Moderately hazardous	Light hazardous
Fireproof	None, except under roofs of two-hour or less fire-resistive construction over hazardous rooms	None, except under roofs of non fire-resistive construction over moderately hazardous rooms	None
Fire-resistant	Over 45 feet or 4 stories, and under roofs of one-hour or less fire resistive construction over hazardous rooms in other buildings	None, except under roofs of non-fire-resistive construction over moderately hazardous rooms	None
Steel Frame	Over 40 feet or 3 stories	Over 45 feet or 4 stories	None
Slow Burning	Over 30 feet or 2 stories	Over 45 feet or 4 stories	None
Ordinary	All buildings	Over 40 feet or 3 stories	Over 45 feet or 4 stories*
Metal	All buildings	Over 40 feet or 3 stories*	Over 40 feet or 3 stories*
Wood Frame	All buildings	Over 30 feet or 2 stories*	Over 30 feet or 2 stories*

Note: *For existing buildings only.

The sprinkler system in hazardous Industrial Buildings and in highly hazardous industrial rooms shall be a Class C system, and in other Industrial Buildings a Class B system.

In rooms where the water from a sprinkler system will create a more hazardous condition than that already existing, the Buildings Engineer may permit the installation of another automatic fire extinguishing system instead of the required sprinklers.

Every Industrial Building 4 stories or 45 feet or less in height shall be equipped with either a First Aid standpipe system or portable fire extinguishers.

Every Industrial Building more than 4 stories or 45 feet but not exceeding 75 feet in height shall be equipped with a First Aid standpipe system.

Every Industrial Building which is more than 75 feet high shall be equipped with a Standard standpipe system.

Where standpipe systems are installed in Industrial Buildings, there shall be at least one hose station in each story and basement in every 6000 square feet of floor area, or fraction thereof, in hazardous Industrial Buildings, and in every 10,000 square feet or fraction thereof, in moderately hazardous or light hazardous Industrial Buildings.

All Industrial Buildings more than 75 feet high shall be equipped with at least one hose outlet on the roof, located as required for hose stations in each story and basement.

Where portable fire extinguishers are provided in Industrial Buildings, there shall be at least one two-and-one-half gallon Class A portable extinguisher in each story and basement in every 2000 square feet of floor area or fraction thereof.

In dry cleaning establishments, each machine which uses a volatile inflammable liquid shall have a steam line directly connected to it, or equipped with a carbondioxide system so arranged as to fill the machine with steam or carbondioxide automatically in case of fire or explosion therein. For special requirement pertaining to dip tanks see the Fire Prevention Code of Baltimore City.

In rooms and spaces in which flammable liquids are handled at least one two-and-one-half gallon Class B portable fire extinguisher shall be provided unless a foam system is installed.

Fire Alarms in Industrial Buildings

Par. 4873. Type E, Ordinary, Type F, Metal, and Type G, Wood Frame, Industrial Buildings which are more than 5000 square feet in area or more than 3 stories or 40 feet in height shall be provided with fire gongs with manual control on each floor.

Heating and Ventilation in Industrial Buildings

Par. 4875. In every Industrial Building, all workshops and manufacturing rooms where employees perform light labor, offices, dressing, locker and toilet rooms, kitchens and dining rooms, and such rooms and parts of such buildings where the employees assemble, shall be provided with a heating system capable of maintaining a temperature of at least 70 degrees Fahrenheit when the outside temperature is zero. In workshops and manufacturing rooms where employees perform hard labor, such temperature shall be at least 50 degrees.

In rooms where the manufacturing process requires temperatures lower than those specified herein, such temperatures shall be in accordance with the requirements of such manufacturing process.

In dry cleaning or dry dyeing rooms, steam, vapor or hot water heating systems only shall be used.

All rooms and other portions of Industrial Buildings normally used by human beings shall be provided with windows or skylights with an open area of at least one-sixteenth of the floor area or a gravity or mechanical ventilating system capable of providing one cubic foot of outdoor air per minute for every 15 square feet of floor area.

All highly hazardous Industrial rooms included in Paragraph 4843 shall be provided with means of ventilation as required by the National Fire Codes for Flammable Liquids and Gases, Edition 1938, published by the National Fire Protection Association.

Dust or vapor removal systems shall be installed in rooms where the manufacturing process creates an atmospheric condition injurious to health or creates a fire hazard.

In dry cleaning rooms in which volatile flammable liquids are used, or in other rooms where Class I or Class II liquids are handled in open vats or other vessels, or Class I, II, or III liquids are heated or so handled as to produce vapor, vent holes shall be provided at or near the floor line not less than 16 square inches in area and placed not more than 16 feet apart, or such rooms shall be equipped with a mechanical vapor removal system capable of removing the lowest 12-inch thick layer of air at least 4 times an hour.

Lighting in Industrial Buildings

Par. 4876. If an Industrial Building is intended to be occupied at times when natural light is inadequate or not available, it shall be provided with lighting facilities capable of furnishing 3 foot-candles at the floor of corridors, exits, aisles in the storage spaces of work rooms, and toilet rooms.

The lighting facilities capable of furnishing the intensity of light at the plane of any work or operation, required by the State Industrial Accident Commission, shall also be furnished.

Electrical Equipment in Industrial Buildings

Par. 4877. The construction and installation of all electrical appliances, equipment and wiring in Industrial Buildings shall comply with the requirements of Part VIII.

Plumbing Requirements in Industrial Buildings

Par. 4878. Every Industrial Building shall be provided with plumbing equipment as follows:

At least one water closet for every 2000 square feet of gross floor area or fraction thereof, but there shall be at least two water closets where both sexes are employed. Two urinals may be substituted for one required water closet for males, but for not more than one-third of the required water closets.

One lavatory for every two water closets and for every four urinals, but at least one in each toilet room.

One sanitary drinking fountain in each story in each 15,000 square feet of floor area or fraction thereof. Drinking fountains shall not be installed in toilet rooms.

SECTION 488

EXISTING INDUSTRIAL BUILDINGS

General Requirements for Existing Industrial Buildings

Par. 4880. Industrial Buildings existing at the time this Code is adopted shall be permitted to continue if the requirements of Section 488 are complied with.

Non-Conforming Construction of Industrial Buildings

Par. 4881. When an Industrial Building, whose type or construction is not in conformity with the provisions of this Code, is altered or reconstructed in such a manner that the type or construction thereof is affected, any and all parts of such Industrial Building affected by the alteration or reconstruction shall be made to conform to all of the requirements of this Code for type and construction of new Industrial Buildings, or as near thereto as the Buildings Engineer may deem reasonable. Repairs on such Industrial Buildings are permitted without conforming to this Code.

Non-Conforming Arrangements of Industrial Buildings

Par. 4882. Non-conforming interior arrangements of existing Industrial Buildings shall be permitted to continue if they do not create a hazard to life. Whenever such interior arrangements are altered, the new arrangements shall conform as nearly as possible to those required for new buildings, but, in any case, the alterations shall create better or safer conditions.

Non-Conforming Heating Plants in Industrial Buildings

Par. 4883. Non-conforming heating plants in Industrial Buildings shall be made to conform to the requirements for new buildings upon notice from the Buildings Engineer, if they constitute a menace to the public safety or general welfare.

Non-Conforming Arrangement of Industrial Buildings

Par. 4884. Where, in an existing Industrial Building, the interior arrangement is not in conformity with the provisions of this Code, it shall be made to conform to the requirements of this Code for the interior arrangement in a new Industrial Building, if such non-conforming arrangement constitutes an imminent hazard to life or property.

However, when an Industrial Building is altered or reconstructed in such a manner that the interior arrangement thereof is changed, the new arrangement shall be made to conform as nearly as possible to the requirements of this Code for the interior arrangement in a new Industrial Building.

Non-Conforming Exits in Industrial Buildings

Par. 4885. Where, in an existing Industrial Building, the exits or means of egress are not in conformity with the provisions of this Code, they shall be made to conform to the requirements of this Code for exits and means of egress in new Industrial Buildings, if such non-conformiing exits or means of egress are a hazard to life.

However, when an Industrial Building is altered or reconstructed in such a manner that the exits or means of egress therein are affected, or the means of egress therein are renewed or altered, all such exits or such means of egress shall be made to conform to the requirements of this Code for exits and means of egress in new Industrial Buildings.

Non-Conforming Fire Protection in Industrial Buildings

Par. 4886. Existing Industrial Buildings not provided with fire protection as required by this Code shall be equipped with such fire extinguishing appliances and equipment so as to comply with the requirements for new Industrial Buildings, upon notice from the Buildings Engineer, where and as requested jointly by the Board of Fire Commissioners and the Buildings Engineer.

Non-Conforming Electrical and Mechanical Equipment in Industrial Buildings

Par. 4887. Where, in an existing Industrial Building, the electrical and mechanical equipment does not conform to the provisions of Part IV of this Code, such equipment shall be made to conform, except as hereinafter provided, to the requirements of Part IV of this Code for the electrical and mechanical equipment of new Industrial Buildings, if such non-conforming equipment or the absence of such equipment constitutes an imminent menace to life or health.

However, when such non-conforming electrical and mechanical equipment is altered, any and all parts of such equipment affected by the alteration, shall be made to conform to the requirements of this Code for electrical and mechanical equipment in new Industrial Buildings.

Non-Conforming Plumbing in Industrial Buildings

Par. 4888. Plumbing in existing Industrial Buildings not in accordance with the requirements of this Code shall be made to conform, upon notice from the Buildings Engineer, if they constitute a menace to the public safety or general welfare.

SECTION 489

MAINTENANCE AND OPERATION OF INDUSTRIAL BUILDINGS

General Maintenance of Industrial Buildings

Par. 4891. Every Industrial Building and all parts thereof shall be kept in good repair and in a safe condition while in use, or any other time when the lack of maintenance affects adjoining property; the roof and walls shall be kept so as not to leak; and all means of draining rain water therefrom shall be kept so as not to cause dampness in the walls, ceilings, or basements. All devices or safeguards which are required by this Code when the buildings are erected, altered or repaired shall be maintained in good working order.

All self-closing fire doors shall be kept normally closed. Automatic fire doors and their operating devices shall at all times be maintained in working order.

Exits, and other means of escape when permitted, shall be maintained at all times in good, safe, usable condition.

The enforcement of all fire prevention regulations shall be by the Fire Department.

The enforcement of all sanitary regulations shall be by the Health Department.

General Operation of Industrial Buildings

Par. 4892. The operation of Industrial Buildings shall be under the supervision of the Fire Department and the Health Department.

Maintenance and Operation of Fire Protection in Industrial Buildings

Par. 4894. The maintenance and operation of fire extinguishing appliances and equipment in Industrial Buildings shall be under the supervision of the Fire Department, who shall also enforce all regulations pertaining thereto. Refer to Chapter 98.

Maintenance and Operation of Heating and Ventilation in Industrial Buildings

Par. 4895. Refer to Part IX for regulations governing the maintenance of heating and ventilating equipment in Industrial Buildings. The operation of such equipment shall be under the supervision of the Health Department, who shall also enforce all regulations pertaining thereto.

Maintenance and Operation of Plumbing in Industrial Buildings

Par. 4896. The maintenance and operation of plumbing in Industrial Buildings shall be under the supervision of the Health Department, who shall also enforce all regulations pertaining thereto.

Maintenance and Operation of Other Electrical and Mechanical Equipment in Industrial Buildings

Par. 4897. All other electrical and mechanical equipment in Industrial Buildings, including all such equipment not specifically required by this Code, shall be maintained and operated so that, at all times, it will meet the requirements of this Code and will not constitute a life or fire hazard.

Posting Regulations in Industrial Buildings

Par. 4898. In every Industrial Building where materials or products are intended to be piled, notices of a permanent character shall be painted or otherwise prominently displayed, stating the live load which the floor is designed to carry. Such notices shall be placed in full view, on each floor.

CHAPTER 49

CLASS IX, SPECIAL STRUCTURES

Sec. 490—Special Buildings.
Sec. 491—Private Bridges and Tunnels.
Sec. 492—Free-Standing and Guyed Chimneys.
Sec. 493—Grain Elevators and Storage Bins.
Sec. 494—Grandstands.
Sec. 495—Accessory Structures.
Sec. 496—Temporary and Portable Structures.
Sec. 497—Signs.
Sec. 498—Amusement Devices.
Sec. 499—Miscellaneous Structures.

SECTION 490

SPECIAL BUILDINGS

Scope of Special Buildings

Par. 4900. Special Buildings shall include all libraries and museums, fire engine houses, freight transfer buildings, power-houses and sub-stations, railroad stations, airplane hangars, filling stations, greenhouses, comfort stations, mausoleums, stables, and other special buildings, which are not included in Chapters 41 to 48, inclusive.

The design, construction and operation of all special buildings shall conform to all requirements of this Code which apply except as specifically regulated in this section.

Libraries and Museums

Par. 4901. All libraries and museums, hereafter erected, over 600,000 cubic feet in volume, shall be Type A, Fireproof, buildings; all those over 300,000 cubic feet in volume shall be Type A, Fireproof, or Type B, Fire-resistant, buildings; and those over 150,000 cubic feet in volume shall be Type D, Slow Burning, buildings or buildings of a higher type. All other libraries and museums hereafter erected may be of any type, except as restricted in Part III.

All stories in libraries and museums shall have at least two exits remote from each other.

The heating, ventilating, lighting, plumbing, fire-extinguishing appliances and all other electrical and mechanical requirements of such buildings shall be in accordance with those of Private Assembly Buildings.

Fire Engine Houses and Police Stations

Par. 4902. Fire Engine Houses shall be not lower than Type E, Ordinary, buildings.

Electrical and mechanical equipment in Fire Engine Houses shall be installed as required by the Fire Department, in accordance with Parts VIII and IX, respectively.

Police Stations shall meet the requirements for Office buildings, as far as they apply, and of the Police Department. The portions of Police Stations in which persons may be detained shall be constructed entirely of incombustible materials and shall be separated from the remainder of the building, if any parts thereof are of combustible materials, by not lower than a two-hour separation, as defined in Paragraph 4075.

Freight Transfer Buildings

Par. 4903. Freight Transfer Buildings over one story or 30 feet in height or more than 120,000 cubic feet in volume shall be not lower than Type D, Slow Burning, buildings.

In all other respects, Freight Transfer Buildings shall conform to the requirements of Storage Buildings in so far as they apply.

Powerhouses, Substations, and Pumping Stations

Par. 4904. Powerhouses, substations, pumping stations and similar plants shall be not lower than Type C, Steel Frame, buildings. Such buildings over 1500 square feet in area shall have not less than two exits, remote from each other.

Railroad Stations

Par. 4905. The concourse and waiting rooms of railroad stations shall conform to the requirements for Public Assembly Buildings; the portion of railroad stations containing offices shall conform to the requirements for Office Buildings, and dining rooms therein shall conform to the requirements for Commercial Buildings.

Airplane Hangars

Par. 4906. Airplane hangars or fire divisions thereof constructed within 50 feet of any adjoining property line or other building shall be either Type A, Fireproof, or Type B, Fire-resistant, buildings. The types of other airplane hangars are unrestricted, except that Type E, Ordinary, Type F, Metal, and Type G, Wood Frame, hangars more than 10,000 square feet in area s'hall be provided with a Class B automatic sprinkler system.

Filling Stations

Par. 4907. Filling stations shall include every lot, building, or portion of a lot or building, used or intended to be used primarily for the purpose of supplying, for immediate use, motor fuel to the tanks of motor vehicles.

The design, layout and arrangement of every filling station shall be such that all buildings, appliances, and all operations, including the motor vehicles being served, will be confined entirely within the property lines of such station, except entrance driveways and such other features which may be permissible under Minor Privilege Permits. Every filling station serving the public shall have a power room and at least two toilets

The area over which vehicles move adjacent to any gasoline service pump shall be paved with a concrete slab at least 10 feet wide extending along the line of vehicular travel for a distance of at least 10 feet in opposite directions from each pump. Such slabs shall be not less than 6 inches thick, reinforced with at least 0.2 per cent of steel in each direction. Other areas over which vehicles move shall be paved with concrete or bituminous bound materials equal in thickness to the paving adjacent to the pumps. All paved areas shall slope with a gradient of not less than one-eighth of an inch per foot toward sumps or gratings within the property lines. Curbs not less than 6 inches high shall be placed where required to direct water to gratings or sumps.

Driveways to and from any filling station across sidewalks shall never exceed 35 feet in width and shall be as nearly at right angles thereto as possible. The design and construction of all such driveways shall be in accordance with the requirements of the Bureau of Highways and a permit therefor shall be secured from the Highways Engineer.

The electric illumination shall be of such type and arrangement that no objectional glare will be caused.

Filling station buildings shall have no cellars or basements. The floor shall be laid directly on the ground and shall be of concrete not less than 3 inches thick, reinforced with at least 0.2 per cent of steel each way. Hollow walls or walls of hollow units shall have the voids filled with an incombustible material or completely sealed with mortar at intervals not exceeding 3 feet and capped with at least 2 inches of solid masonry. Filling station buildings less than 10 feet from any property line or any other building, shall be not lower than Type B, Fire-resistant, buildings.

All heating and power equipment likely to produce heat or sparks, or cast open flames, shall be installed in the power room. Such room shall be enclosed by not lower than three-hour fire-resistive construction. Openings in the walls of such rooms shall be permitted into offices, or similar rooms, and to the outside, but exterior openings shall not be placed within 5 feet of any property line. Openings into any other part of the building shall be permitted, if the heating and power equipment is placed at least 30 inches from the floor of the power room. All openings shall be protected by self-closing Class C fire doors.

All washing and greasing of motor vehicles shall be done under cover. Greasing pits more than 75 square feet in area in lubricating rooms enclosed on more than 2 sides shall be equipped with a mechanical ventilating system which will change the air at the floor of the pits not less than 6 times every hour.

Tool boxes, racks and miscellaneous structures shall be of incombustible material.

Drawings for filling stations shall, in addition to the requirements of Paragraph 1312, show all underground equipment, piping, tanks, flood lights, conduits, public utilities and other subsurface structures in place.

Special Buildings for Amusements

Par. 4908. Buildings used for bowling alleys, shooting galleries and for similar purposes of amusement where the average density of population never exceeds one person to thirty square feet of the area of all floors, shall conform in all respects to the requirements for light hazardous Commercial Buildings in Chapter 46.

Other Special Buildings

Par. 4909. Greenhouses more than 500 square feet in area or 20 feet in height shall have incombustible structural frames, unless any part of such structures is at least 20 feet from any adjoining property line or another building. Such structures shall have foundation walls of masonry or reinforced concrete extending at least 18 inches above the ground level. The ground floor shall be of concrete not less than 3 inches thick or of other masonry not less than 4 inches thick, and shall be tightly sealed to the foundation walls.

Greenhouses not more than 500 square feet in area or 20 feet in height shall be considered accessory structures. Refer to Paragraph 4955.

Comfort Stations shall be not lower than Type E, Ordinary, buildings above ground, and Type A, Fireproof, buildings below ground.

Mausoleums shall be constructed of incombustible materials.

Stables not over one story and storage loft, or 20 feet in height, shall be either Type A, Fireproof, Type B, Fire-resistant, or Type D, Slow Burning, buildings. Other stables shall be Type A, Fireproof, buildings. No stable shall be erected less than 5 feet from any adjoining property line. Stables which are Type D, Slow Burning, buildings shall not be erected less than 10 feet from any adjoining property line. Wharves and piers are regulated and supervised by the Bureau of Harbors, but when used as foundations for buildings, they shall comply with the applicable requirements of this Code.

All other special buildings shall comply with the applicable requirements of this Code.

SECTION 491

PRIVATE BRIDGES AND TUNNELS

Scope of Private Bridges

Par. 4910. Private bridges shall include all bridges over public or private property used or intended to be used by the employees or patrons of the owner of such bridges, and which bridges are not under the jurisdiction of the Bureau of Highways.

General Regulations for Private Bridges

Par. 4911. Except as required in Paragraph 7752 for bridges in horizontal exits, all parts of private bridges within 20 feet of a building shall be constructed of incombustible material. Doors opening on private bridges shall be Class B fire doors.

Private bridges shall be kept in good repair and, when connecting buildings, shall drain all rain water so as not to cause dampness in the walls or basements of the adjoining buildings, and they shall be kept free and clear of any obstruction and no part thereof shall be used for storage.

Private Bridges for Pedestrians

Par. 4912. Private bridges for pedestrians and hand trucking shall be designed for the highest live load to which they may be subjected, but for never less than 100 pounds per square foot, or the lesser live load of the contiguous floor they serve.

Bridges for Conveyors

Par. 4913. Bridges for conveyors shall be designed for a live load of not less than 50 pounds per square foot of walkway and the weight of the fully loaded conveyor or pipe line.

Private Bridges for Vehicles

Par. 4914. Private bridges for highway vehicles shall be designed for at least an H-15 live load, as specified by the "Standard Specifications for Highway Bridges", adopted by the American Association of State Highway Officials, Edition 1935.

Private Tunnels

Par. 4915. Tunnels constructed under public or private property and used or intended to be used by the employees or patrons of the owner of such tunnels shall be constructed of masonry at least 8 inches thick or reinforced concrete at least 6 inches thick with a floor of masonry or reinforced concrete not less than 4 inches thick.

SECTION 492

FREE-STANDING AND GUYED CHIMNEYS

Scope of Free-Standing and Guyed Chimneys

Par. 4920. Free-standing chimneys shall include all chimneys which are supported on independent footings, or upon incombustible supports built in or on a building, and in no way attached above their base to any building or other structure.

Guyed chimneys shall include all chimneys tied by struts, wires or rods to other buildings or structures so as to be more stable.

Classification of Free-Standing and Guyed Chimneys

Par. 4921. Chimneys shall be classified as low temperature, medium temperature, and high temperature, in accordance with Paragraph 7841.

Height of Free-Standing and Guyed Chimneys

Par. 4922. Free-standing and guyed chimneys shall be constructed to a height sufficient to protect adjoining buildings and to prevent air pollution. The height of all chimneys shall be in no case less than that specified in Paragraph 7843.

General Requirements for Free-Standing and Guyed Chimneys

Par. 4923. All free-standing and guyed chimneys shall be supported on incombustible construction.

Such chimneys shall support no loads other than their own weight and resist no forces other than those due to wind. This shall not be held as forbidding the use of staging for construction and maintenance.

Every free-standing or guyed chimney shall be provided with a cleanout opening equipped with a tight-fitting iron door at the base.

The walls of free-standing chimneys shall be of either Grade A or B brick, radial chimney tile, cast stone, cut stone, reinforced concrete or metal.

The minimum thickness of masonry chimneys, exclusive of the linings, shall be 7 inches for radial chimney tile and 8 inches for other masonry units.

The mortar for masonry of free-standing chimneys shall be either high-strength chimney mortar or low-strength chimney mortar, mixed according to the following:

> High-strength chimney mortar shall contain not less than one part Portland cement to three parts of sand. An admixture of inert material, such as lime or fire clay, will be permitted up to 15 per cent of the volume of the mortar.
>
> Low-strength chimney mortar shall contain not less than three parts of cement-lime ingredients to five parts of sand by volume. The cement-lime ingredients shall be proportioned not less than one part Portland cement to two parts of lime paste.

All masonry chimneys shall be finished at the top with a coping which protects the masonry from the weather.

Steps shall be provided on either the outside or the inside of all masonry chimneys from a point not more than 10 feet above the finished ground level to the top. They shall be spaced uniformly about 15 inches center to center and shall be not less than three-quarter inch round bars in one piece, of galvanized iron or non-corroding metal, 15 inches wide, set 6 inches from the wall, with legs set not less than 5 inches into the wall, and ends turned at right angles 2 inches into the masonry.

The width of flues or breechings entering a chimney shall not exceed the following:

> 30 per cent of the external diameter for circular chimneys.
>
> 40 per cent of the shorter external diameter for octagonal chimneys.
>
> 50 per cent of the side for square chimneys.

Design of Free-Standing Masonry Chimneys

Par. 4924. Reinforced concrete chimneys and footings shall be designed as required in Paragraph 6591.

Masonry chimneys which are not reinforced shall be designed on the assumption that the masonry is incapable of resisting tensile stresses and that all exterior forces are resisted by compressive and shearing stresses in the masonry. The minimum factor of safety against overturning shall never be less than 1.8 for the chimney as a whole or any portion thereof, for wind in any direction.

The compressive stresses in pounds per square inch for masonry laid-up in high-strength chimney mortar shall not exceed 300 for radial chimney tile, nor 250 for other masonry.

The compressive stresses for masonry laid-up in low-strength chimney mortar shall not exceed two-thirds of that permitted for high-strength chimney mortar.

Masonry chimneys shall be reinforced with steel bands, at least equal in area to a bar one-quarter inch by three inches, embedded in the masonry and otherwise adequately protected from the weather. There shall be at least one such band in the chimney head, one above and one below every flue opening, and one at each corbel supporting sectional lining.

All masonry and reinforced-concrete chimneys subjected to a temperature over 1500 degrees Fahrenheit and all chimneys built of common brick shall have a steel band at each change of wall thickness.

All masonry chimneys subjected to a temperature over 2000 degrees Fahrenheit shall have steel bands placed at vertical intervals not exceeding 10 feet.

Design of Free-Standing Metal Chimneys

Par. 4925. Free-standing metal chimneys shall be anchored to the footings so as to fully resist the tension due to wind. The thickness of the metal shall be not less than one-quarter inch. The allowable stresses shall not exceed two-thirds of those given in Section 632.

Design of Guyed Metal Chimneys

Par. 4926. The thickness of the metal shall be not less than that specified for built-in metal chimneys in Paragraph 7847. The allowable stresses shall not exceed two-thirds of those given in Section 632.

Each guy wire shall be designed to resist the entire wind reaction at the collar of the stack. The stack shall be considered as being simply supported at the base and at the collar.

Lining for Free-Standing and Guyed Chimneys

Par. 4927. Free-standing masonry chimneys, except as required below, shall be lined above the flue opening for a distance of not less than 10 feet for low temperature chimneys and one-fifth of the height, but not less than 20 feet for medium temperature chimneys. Chimneys of cut-stone, cast-stone or reinforced concrete for low and medium temperature chimneys shall be lined to a point not less than 30 feet above the flue opening. All high temperature masonry chimneys shall be lined throughout their height with independent and self-supporting lining.

No lining is required for low temperature metal chimneys, but medium and high temperature metal chimneys shall be lined throughout their height.

The lining of low and medium temperature chimneys shall be of perforated radial tile or solid radial fire brick and in high temperature chimneys it shall be of solid radial fire brick, except as permitted below for metal chimneys. The thickness of the lining shall be not less than 4 inches. The brick shall be laid with full joints as thin as practicable, cut flush. The lining shall begin not less than 2 feet below the bottom of the flue opening and shall be separated from the shaft, except for metal chimneys, by not less than 2 inches of air space. The lining shall be built after the shaft is finished and the air space shall be kept free from all foreign material and obstructions. The lining shall be capped with fire brick which will cover the air space. All steel used to support linings at flue openings shall be completely covered with at least 2 inches of concrete.

Reinforced concrete or gunite at least 2 inches thick of heat-resistive cement and burnt shale or clay aggregate shall be permitted as lining for metal chimneys. The reinforcement shall be supported by clips cr nuts welded to the chimney. Other linings meeting the approval of the Buildings Engineer may also be permitted.

Construction and Maintenance of Free-Standing and Guyed Chimneys

Par. 4928. In masonry chimneys, the brick or radial tile shall be laid in running bond and at least every third course shall be a header course breaking all horizontal and vertical joints. The face brick or tile and back-up brick or tile shall be laid at the same time and completely bonded together. The mortar joints shall not exceed one-half inch in thickness.

Flue openings for masonry chimneys shall be lined on the reveals with refractory material. The masonry above each rectangular opening shall be supported on steel beams resting on steel plates, and such beams shall have space for expansion at each end, and shall be encased completely by 4 inches of masonry or 2 inches of concrete.

All free-standing or guyed chimneys which are dangerous in any manner whatever shall be repaired and made safe or taken down.

Lightning Conductor Systems for Masonry and Reinforced Concrete Chimneys

Par. 4929. All masonry and reinforced concrete chimneys over 50 feet in height shall be provided with a lightning conductor system.

Lightning conductor systems for chimneys less than 200 feet in height shall have at least one vertical conductor while chimneys 200 feet or over in height shall have two vertical conductors, diametrically opposite each other.

The vertical conductors shall be connected at the bottom to the ground and at the top to a horizontal cable. These conductors shall be continuous, without splices, and shall be fastened securely flat against the chimney with screw clamps spaced not over 10 feet apart. The conductors shall be not less than 5/16 inch diameter copper conductors for chimneys less than 60 feet high and not less than 7/16 inch diameter copper conductors for higher chimneys.

The horizontal cable shall be of the same size as the conductors and shall be fitted with rods around the periphery of the top of the chimney, not more than 6 feet apart, and projecting vertically not less than 6 inches above the top of the chimney. The rods shall be of copper properly secured. All splices and contacts shall be brazed or soldered. When required to resist acid gases, the entire conductor system above a point 25 feet below the top of the chimney shall be coated with chemically pure lead one-sixteenth of an inch thick.

Lightning grounds for masonry chimneys shall consist of ground rods or girdle around the foundation of the chimney Each vertical conductor shall be connected by a soldered joint or copper-covered ground clamp to a ground. Ground rods shall be steel rods seven-eights of an inch in diameter, covered with a substantial copper sheath and shall be driven at least 8 feet into the ground. The ground rods shall have not less than 30 per cent copper by volume. The girdle shall consist of a copper strip one-eighth by two inches, or equivalent, placed not less than 18 inches below finished ground level.

SECTION 493

GRAIN ELEVATORS AND STORAGE BINS

Scope of Grain Elevators and Storage Bins

Par. 4930. Grain elevators and storage bins shall include structures used for storing and handling of grain, coal, sand, ores and other similar materials.

Grain Elevators

Par. 4931. Grain elevators shall conform to the requirements for Industrial Buildings, in Chapter 48.

Grain Bins and Coal Pockets

Par. 4932. Grain bins, coal pockets and other similar structures exceeding 35 feet in height shall be of steel, concrete or other incombustible material. Such structures not exceeding 35 feet in height and which are at least 10 feet from any adjoining property line or other buildings may be constructed of wood.

When the lowest part of such bins or pockets is within 2 feet of the ground level, they shall be constructed with a foundation wall extending not less than 2 feet above the ground level. If the bottom slab rests on the ground it shall be constructed of concrete not less than 3 inches thick or other masonry not less than 4 inches thick.

Design of Shallow Bins

Par. 4934. A shallow bin is one in which the plane of rupture of the stored material cuts the free surface of the filling. The lateral pressure on the bin walls shall be computed in accordance with Paragraph 6054.

Design of Deep Bins

Par. 4935. A deep bin is one in which the plane of rupture of the stored material cuts the sides of the bin. Both vertical and lateral pressures are assumed to be constant at all points on a horizontal plane.

The vertical and horizontal pressures shall be assumed to be not less than those given by the following formulas:

$$V=\frac{RW}{ku'}\left[1-\frac{1}{e\left(\frac{ku'H}{R}\right)}\right]$$

$$L=kV$$

V=vertical pressure in pounds per square foot.
L=lateral pressure in pounds per square foot.
A=area of bin in square feet.
D=diameter of bin or diameter of an inscribed circle between bin walls, in feet.
e=base of Naperian logarithms.
H=height of material above point in question, in feet.
P=perimeter of bin, in feet.
R=hydraulic radius, $\frac{A}{P}$
u′=coefficient of friction of the material on the bin walls.
W=weight of the stored material in pounds per cubic foot.
Unless determined by experiments, k shall be taken as 0.6 when computing pressures on walls and as 0.3 when computing pressures on the bottom of deep bins.

In the absence of more accurate data, the values given in the following table may be used in the design of bins. Values assumed for materials not listed shall meet the approval of the Buildings Engineer.

TABLE 4935T

WEIGHT AND COEFFICIENT OF FRICTION FOR VARIOUS MATERIALS

Kind of Material	W	Coefficient of Friction				
		Material on Material	Material on Rough Wood or Cribbing	Material on Smooth Wood	Material on Iron	Material on Concrete
GRAINS						
Barley	39	0.507	0.424	0.325	0.376	0.452
Beans	46	0.616	0.435	0.322	0.366	0.442
Corn	44	0.521	0.344	0.308	0.374	0.423
Flaxseed	41	0.456	0.407	0.308	0.339	0.414
Oats	28	0.532	0.450	0.369	0.412	0.466
Peas	50	0.472	0.287	0.268	0.263	0.296
Wheat	50	0.466	0.412	0.361	0.414	0.444
FUEL						
Anthracite Coal	52	0.509	0.466	.....	0.286	0.510
Bituminous Coal	50	0.700	0.700	.....	0.325	0.700
Coke	32	.....	0.839	.....	0.466	0.839
OTHER MATERIALS						
Ashes	45	0.839	0.839	.....	0.600	0.839
Clay Dry	63	1.000	0.600	.....	.....	0.600
Sand Dry	100	0.674	0.577	.....	0.325	0.577
Gravel Dry	135	0 700	0.600	.....	.....	0.600

SECTION 494

GRANDSTANDS

Scope of Grandstands

Par. 4940. Grandstands shall also include such structures as stadiums, bleachers, reviewing stands, observation stands and band stands and structures used for similar purposes.

General Requirements for Grandstands

Par. 4941. All grandstands shall be designed for a live load of at least 100 pounds per square foot and for wind forces as specified in Section 605.

Grandstands shall not be erected on the roof of any structure or building.

Grandstands shall be in accordance with all other provisions of this Code in so far as they apply.

Concrete Grandstands

Par. 4942. Grandstands of concrete construction shall not be limited as to height or area.

Metal Grandstands

Par. 4943. Grandstands of metal construction not encased in concrete shall not be limited as to height or area.

Wooden Grandstands

Par. 4944. Grandstands of wood construction shall not be permitted within 10 feet of any adjoining property lines, or within 20 feet of any wood frame structure. The area of any such grandstand shall not exceed 5000 square feet. The level of the highest seats shall be not more than 25 feet above the ground immediately in front of such grandstand.

Temporary Wooden Stands

Par. 4945. Temporary wooden stands or bleachers shall not be closer than 10 feet to any wood frame building. A free passageway of 6 feet wide shall be maintained between the ends of two adjacent such stands or bleachers.

Such stands or bleachers shall be not more than 16 feet deep nor more than 32 feet long. The level of the highest seats shall be not more than 25 feet above the floor or ground immediately in front of such stands or bleachers.

Aisles, Seats and Exits for Grandstands

Par. 4946. There shall be not more than 15 seats between the end aisle and the end of any grandstand nor more than 30 seats between any two aisles.

The exit or aisle width per hundred seats served by such exits or aisles shall be not less than 20 inches for grandstands of wood construction nor less than 12 inches for grandstands of metal or concrete construction. No exit or aisle shall be less than 30 inches wide.

The treads and risers in aisles and stairs shall be proportioned in accordance with Paragraph 7736.

Existing Grandstands

Par. 4947. Non-conforming existing grandstands shall be made to conform with the requirements of this Section upon notice from the Buildings Engineer, when they are reconstructed or altered.

Inspection and Maintenance of Grandstands

Par. 4948. All grandstands shall be inspected by the Buildings Engineer at least once each spring previous to the first day of May, and such grandstands shall be repaired by the owners thereof to the extent deemed necessary by the Buildings Engineer to make them safe before such grandstands are used.

SECTION 495

ACCESSORY STRUCTURES

Scope of Accessory Structures

Par. 4950. Accessory structures shall include all detached private and multiple garages, sheds, small greenhouses, chicken and pigeon houses, doghouses, privies, manure pits and other buildings or structures used in connection with, or accessory to a principal building or structure.

General Requirements for Accessory Structures

Par. 4951. Accessory structures shall be in accordance with all other provisions of this Code in so far as they apply.

Detached Private and Multiple Garages

Par. 4953. A detached private garage is a building having a capacity of not more than three automobiles, a floor area not exceeding 600 square feet measured inside of the walls, and a height of not over one story.

The construction, type and location of such garages shall be in accordance with the requirements in Part III.

Multiple garages divided into units not exceeding 400 square feet in area by not lower than two-hour fire-resistive walls shall be permitted to be constructed in accordance with this Paragraph. Subdivision walls or partitions in such garages shall be of incombustible materials.

Floors of all garages shall be of concrete not less than 4 inches thick and shall slope to the door openings or to gutters or floor drains, and such paving shall continue for not less than 3 feet out from the building.

A masonry cut-off wall not less than 6 inches thick and extending at least 2 feet below the ground surface, shall be placed under the door sill and tightly sealed against the foundation walls on both ends.

Accessory Sheds

Par. 4954. Sheds intended or used for the storage of materials or tools, or for shelter of workmen, or animals, or for outdoor manufacturing, and which are not over 1000 square feet in area, or more than one story or 15 feet in height, shall not be required to conform to any building type.

The ground floor of all such sheds shall be of concrete not less than 3 inches thick or of other masonry not less than 4 inches thick. Such floor shall be entirely surrounded by masonry walls not less than 6 inches thick, extending at least 2 feet below the ground level, and the floor shall be sealed tightly to such walls.

A shed constructed of combustible material shall not be placed within 20 feet of a wood frame building or within 10 feet of any other structure or any property line.

For construction sheds, see Paragraph 4964.

Sheds shall not be limited as to location except as regulated in Part III.

Greenhouses Not More Than 500 Square Feet In Area

Par. 4955. Greenhouses not more than 500 square feet in area or 20 feet in height shall be considered as accessory buildings and may be any building type. Greenhouses with wood frames shall be not less than 5 feet from any structure or any adjoining property line.

For other greenhouses, refer to Paragraph 4909.

Chicken and Pigeon Houses and Doghouses

Par. 4956. All chicken and pigeon houses, doghouses and other similar houses for pets 25 square feet or more in area shall be not less than 10 feet from any building or any adjoining property line.

The floor of every chicken and pigeon house shall be not less than 2 feet above the ground.

Privies and Manure Pits

Par. 4957. Privies shall be permitted only where sanitary sewers are not available, and shall be placed at least 30 feet from the exterior wall of any building used for human occupancy.

Privies shall not be required to conform to any building type. They shall be constructed weathertight, and provided with a tight-fitting door. All window openings shall be screened.

The ground floor of all privies shall be of concrete not less than 3 inches thick or of other masonry not less than 4 inches thick. Such floor and the pit shall be entirely surrounded by masonry walls not less than 6 inches thick extending at least 2 feet below the ground level, and the floor shall be sealed tightly to such walls.

The pit under privies shall be at least 3 feet 6 inches deep, and not less than 6 square feet in area. Provisions shall be made to prevent surface water from entering the pit. The pit shall be covered entirely by a tight box, and the openings therein shall be provided with hinged covers.

Manure pits shall be permitted only in connection with stables. They shall have walls of masonry or reinforced concrete and a concrete floor not less than 4 inches thick, and shall be kept covered while being used for its intended purpose.

All applications for privies and manure pits shall be approved by the Commissioner of Health before permits are issued.

Other Accessory Structures

Par. 4959. All accessory structures not mentioned in this Section shall be designed, constructed and maintained in accordance with all of the applicable provisions of this Code, and they shall be subject to the approval of the Buildings Engineer.

SECTION 496

TEMPORARY AND PORTABLE STRUCTURES

Scope of Temporary and Portable Structures

Par. 4960. Temporary and portable structures shall include temporary buildings, portable schools, construction sheds, booths, car bodies, tourist cabins, and all other structures of temporary construction or location.

General Requirements for Temporary and Portable Structures

Par. 4961. Temporary and portable structures shall be in accordance with all other provisions of this Code insofar as they apply, except as otherwise specifically regulated or required by Section 496.

Temporary Buildings

Par. 4962. Temporary buildings not exceeding 2500 square feet in area, or 15 feet in height, shall not be required to conform to any building type. Temporary buildings constructed of combustible materials shall be not less than 10 feet from any adjoining property line or any wood frame building.

Portable Schools

Par. 4963. Portable schools not exceeding 10,000 cubic feet in volume shall not be required to conform to any building type. Portable schools constructed of combustible materials shall be not less than 10 feet from any adjoining property line or any wood frame building.

Construction Sheds

Par. 4964. Construction Sheds shall not be placed less than 10 feet from any adjoining property line, or less than 10 feet from any wood frame or metal building.

Construction sheds shall not be required to conform to any building type.

Booths

4965. Temporary Booths shall not be placed less than 5 feet from any wood frame building.

Car Bodies

Par. 4966. Car Bodies and other similar structures shall be considered temporary structures, except where set on permanent foundations.

Tourist Cabins

Par. 4967. The term "tourist cabin" for the purpose of this Code is defined to be and shall include any building not exceeding one story in height and 1500 cubic feet in volume, designed to be used for not more than one family for living or sleeping quarters.

All tourist cabins shall be constructed in accordance with all of the provisions and requirements of this Code for Dwellings, except as provided in Paragraph 4967 of this Code.

The foundations of all such cabins shall be of masonry, constructed in conformity with the requirements of Section 294 of this Code. Every such cabin shall have a floor constructed of wood or incombustible material not less than one foot from the ground, and the walls thereof shall be lined on the inside with plaster, sheet rock, plywood or other similar material.

There shall be a clear space of not less than 10 feet between any such cabin and another such cabin or other structure, and no part of any such cabin shall be erected less than 10 feet from any adjoining property line.

Bathing and toilet facilities for both sexes shall be constructed or erected within 200 feet of every tourist cabin.

Tents

Par. 4968. Tents shall be permitted to be erected only for a period of not more than 30 days for bazaars, entertainments, circuses or for storage. Tents shall not be erected nearer than 20 feet to any adjoining property line or any building. All tents shall be erected to resist a wind pressure or vacuum of 10 pounds per square foot. When tents are used for any assembly purposes, exits shall be provided at the rate of not less than 20 inches of width for each 500 square feet of seating area and public space enclosed therein, but no exit shall be less than 48 inches wide. One Class A, two-and-one-half gallon portable fire extinguisher shall be placed in every 5000 square feet or fraction thereof in tents used for Public Assembly.

Tents not exceeding 120 square feet in area when erected in the rear of Dwellings shall be exempt from the requirements for tents.

Tents shall not be used for the display of motion pictures unless safety film is used.

SECTION 497

SIGNS

General Requirements for Signs

Par. 4970. For the purpose of this Code signs are classified according to their types as follows:

Bulletin signs.
Flat Box signs.
Projecting signs.
Banner signs.
Portable signs.
Placard signs.
Festoons and Pylons.
Miscellaneous signs.

The drawings required in Section 132 to accompany the applications for signs may be omitted at the discretion of the

Buildings Engineer, if the proposed sign is to be constructed in strict accordance with standard designs previously approved by the Buildings Engineer, except that drawings and specifications shall accompany each application for a projecting sign over 45 square feet in area.

A minor privilege permit approved by the Board of Estimates is required for all signs on or over any street, alley, or other public way or property owned by the Mayor and City Council of Baltimore, as set forth in Chapter 21, "Regulations for Use of Streets and Other Public Property".

All electrical wiring and equipment for signs shall be in accordance with Part VIII, the Electrical Part of this Code.

The structural design and construction of all signs, including their supports, shall be in accordance with all applicable requirements of this Code unless otherwise provided for in this Section.

All round iron or steel less than 3/8 inch in diameter and all other iron or steel members or sheathing less than 3/16 inch in the least dimension shall be galvanized. Sheet metal used in the construction of signs shall be not less than No. 26 U. S. Standard Gauge.

Signs shall not be so placed that they will interfere with the ingress or egress through windows, except where permitted by the Fire Department, or through doors, or other means of egress in required exits.

Bulletin Signs

Par. 4971. Bulletin signs include all flat, solid or open single face signs supported on a structural framing or a wall.

Bulletin signs shall be entirely of incombustible materials if any parts thereof are more than 20 feet above the ground level.

Where a bulletin sign, erected on the ground is facing a street, alley or other public way, the horizontal distance between any part of such sign and the street or alley line shall be not less than the height of the sign above the level of the street, alley or public way, unless the sign is less than 10 feet in height, or the sign is constructed entirely of steel, of other approved incombustible materials, or of creosoted lumber.

All parts of bulletin signs shall be at least 3 feet from any public utility pole or wire.

Where any part of a bulletin sign is of the box type, it shall also conform to the applicable requirements of flat box signs in Paragraph 4972.

Flat Box Signs

Par. 4972. Flat box signs include all signs constructed in the shape of a box enclosed on all sides.

Box signs shall be constructed entirely of metal or other approved incombustible material.

All box signs wired for electricity not bearing the label of approval of the Underwriters Laboratories, Inc., shall be inspected and a special approval of the Buildings Engineer secured before the erection thereof.

The sheet metal on box signs shall be stiffened by metal angles or other approved shapes spaced not farther apart than one thousand times the thickness of the metal. The joints shall be either riveted, bolted or locked seams, except where spot welding is specifically permitted by the Buildings Engineer. Where the supporting members are attached to sheet metal of less than No. 18 U. S. Standard Gauge, reinforcing metal strips not less than 3 inches wide and of No. 16 gauge shall be placed along and on the opposite face from the supporting members.

Projecting Signs

Par. 4973. Projecting signs include all signs projecting out from a building or other structure and supported thereon, by means of poles, wall irons, other structural members or framework. Such signs are either of the fixed, hinged or pendant type.

Fixed projecting signs include all projecting signs, which are supported rigidly on walls or on framework rigidly attached to buildings or other structures.

Hinged signs include all projecting signs attached to buildings or other structures by hinged wall irons so arranged that the sign can be swung about a vertical axis flat against the building or other structure.

Pendant signs include all projecting signs suspended from a horizontal pole or other structure and so arranged that the signs can be swung about a horizontal axis.

Projecting signs over any street, alley or other public way shall be entirely of incombustible materials in the following cases:

a. Where they project more than 3 feet from a building or structure.

b. If they are over 45 square feet in area.

c. If any part of such sign is more than 20 feet above the ground level.

The area of a pendant sign shall not exceed 50 square feet, and it shall not extend more than 6 feet below its horizontal support.

Where anchors of projecting signs are attached to parapet walls, the points of attachment shall be not more than 2 feet above the roof beams or trusses and not less than 3 feet from the top of the parapet wall.

The supporting tension members of projecting signs shall be rods, cables or structural shapes having a net cross sectional area of not less than 0.2 square inches. The poles of pendant signs shall be of not less than 2 inch standard wrought iron pipe or the equal thereof.

All bolts fastening projecting signs, exceeding 45 square feet in area, to walls shall be not less than ¾ inch in diameter. Where such bolts connect tension members to walls 13 inches or less in thickness, they shall be through bolts, and in walls of greater thickness they shall be embedded sufficiently to develop their total strength.

All eyebolts, shackles, turnbuckles, cable clamps and other fittings shall be designed to develop the full strength of the members they connect or to resist the actual forces in such members. Open hooks shall not be used as connectors.

Projecting signs, exceeding 45 square feet in area and attached to a wall 14 inches or less in thickness, shall be hinged signs.

All parts of projecting signs shall be at least 3 feet from any public utility pole or wire.

Where projecting signs are of the box type, they shall also conform to the applicable requirements of flat box signs in Paragraph 4972.

Banner Signs

Par. 4974. Banner signs include all signs made of fabrics, netting and similar materials suspended on ropes, cables or poles.

Banner signs placed over streets, alleys or other public ways shall be of at least 6 ounce canvas or of a substantial netting with a 2 inch or smaller mesh. The suspending ropes shall be at least ¾ inch in diameter for spans not exceeding 40 feet, and at least 1 inch in diameter for spans 40 feet or over but not exceeding 100 feet. Guy ropes shall be at least ½ inch in diameter. Where wire cables are used they shall have an equal strength to the ropes required.

All holes serving to attach the ropes to the fabric shall be provided with grommets.

Suspending ropes or cables shall not be attached to such parts of a building or structure which are not able to resist the full tension value of the rope or cable.

All parts of a banner sign shall be at least 5 feet from any public utility pole or wire.

Portable and Placard Signs

Par. 4975. Portable signs may be of any construction and shall be securely anchored in position.

Placard signs shall be securely fastened to walls or other stable structures with a solid surface.

Festoons and Pylons

Par. 4976. For the purpose of this Code festoons and pylons shall also include streamers, buntings, floats, arches, barriers and other decorations for carnivals or similar purposes.

Festoons and pylons constructed of flammable materials shall not be hung or erected in any building. Festoons and pylons of combustible materials shall not be hung or erected in Type E, F or G buildings.

For regulations of electric lighting of festoons see Paragraph 8298.

Miscellaneous Signs

Par. 4977. Miscellaneous signs include all signs or decorations not provided for in the preceding Paragraphs. All such signs shall be designed, constructed and erected in accordance with the applicable requirements of this Code and shall be subject to the approval of the Buildings Engineer.

Existing Signs

Par. 4978. All existing non-conforming signs shall be made to conform to the requirements of this Section when they are enlarged, rebuilt, structurally altered or relocated.

Maintenance of Signs

Par. 4979. All signs shall be maintained by the owners thereof in a safe condition, and all exposed parts shall be kept free from decay or corrosion by painting, galvanizing or other approved methods.

Signs which are dangerous in any manner shall be made safe or removed.

SECTION 498

AMUSEMENT DEVICES

Scope of Amusement Devices

Par. 4980. Amusement devices shall include all mechanical or other devices used for amusement only.

General Requirements for Amusement Devices

Par. 4981. Amusement devices shall be in accordance with all other provisions of this Code insofar as they apply.

Roller Coasters and Similar Devices

Par. 4983. Roller coasters and similar amusement devices, unless constructed of reinforced concrete or steel protected with a three-hour fire-resistant covering, shall not be erected within the first Fire Zone. Such structures in the second Fire Zone shall be constructed of incombustible materials. Outside of these areas, roller coasters constructed of wood shall be at least 20 feet from any adjoining property line and at least 20 feet from any building or other structure. When the wood structure exceeds 30 feet in height, the timber shall meet the requirements for wood structures in Type D, Slow Burning, buildings, Chapter 54. No wooden structure shall exceed 60 feet in height.

All roller coasters and similar amusement devices shall be designed to resist all live loads and the impact required by Paragraph 6043. At the curves, the speed of cars shall not exceed 15 miles per hour and the rails shall be banked to take the resultant of all stresses normally. On dips, the component of the centrifugal force normal to and away from the rails shall not exceed two-thirds of the component of gravity normal to and toward the rails. In roller coasters built of wood, all structural connections shall be bolted.

No part of the ride from a roller coaster or other amusement device shall be under the ground level and no part more than 10 feet above the ground level shall be enclosed. Where any portion is enclosed, exits shall be provided not over 100 feet apart and marked with internally illuminated exit signs as specified in Section 789. The car in its travel shall not normally remain in any enclosure more than 5 minutes.

All roller coasters and similar devices shall be provided with a positive acting signal system in plain view of the operator which will warn the operator of the stoppage of any car and will enable the operator to ascertain that each section of the ride is clear before permitting any car to enter that section.

Other Amusement Devices

Par. 4984. Amusement devices, other than those covered by this Section, unless constructed of reinforced concrete or steel protected with three-hour fire-resistant covering, shall not be erected within the first Fire Zone. Such structures in the second Fire Zone shall be constructed of incombustible materials.

Outside of the First Fire Zone and Second Fire Zone such amusement devices shall meet the same requirements as roller coasters of the same height.

Operation and Maintenance of Amusement Devices

Par. 4989. The Buildings Engineer shall require that all amusement devices shall be structurally safe, making due allowance for impact, wear and injury during operation. When necessary for safety, the Buildings Engineer shall limit the speed of operation of such devices or order such alteration as he shall deem necessary. When the operation of any device is dangerous, such device shall be dismantled and removed.

The Buildings Engineer shall have the power to determine the number and location of exits from any place of amusement.

SECTION 499

MISCELLANEOUS STRUCTURES

Scope of Miscellaneous Structures

Par. 4990. Miscellaneous structures shall include retaining walls, fences, swimming pools, towers, parking lots, platform scales and other miscellaneous structures.

General Requirements for Miscellaneous Structures

Par. 4991. Miscellaneous structures shall be in accordance with all the other provisions of this Code insofar as they apply.

Retaining Walls

Par. 4992. Retaining walls shall include gravity walls of plain concrete or other masonry, reinforced concrete walls, bulkheads, cribs and revetments.

They shall be designed to resist all vertical loads and lateral forces to which they may be subjected, and to be safe against overturning, sliding on the base and settlement.

The resultant force on the base, when the wall is founded on compressible soil, shall fall inside the middle third of the base, and, when founded on incompressible soil, the resultant shall fall so that the factor of safety against overturning shall be not less than two.

The maximum pressure on the base shall not exceed the allowable bearing value of soils as set forth in Paragraph 7012.

The bottom of a retaining wall shall be at least 3 feet below ground level.

Retaining walls not designed for hydrostatic pressure shall be properly drained. Where possible, a layer of gravel or crushed stone not less than 12 inches thick shall be placed along the entire back of the wall and this drained by means of weep holes at least 4 inches in diameter through the wall just above the ground. The weep holes shall be spaced not more than 10 feet on centers but at least one shall be placed in each cell or each space between the counterforts where such exist.

Reinforced concrete retaining walls shall be designed and constructed in accordance with Chapters 64, 65 and 66.

Gravity retaining walls shall be so designed as to prevent the formation of tensile stresses in any part of the masonry. The masonry materials for gravity walls shall meet the applicable requirements of Chapter 61.

Revetments shall have a slope not greater than the angle of repose of the material held in place. Revetments of concrete or brick shall be not less than 4 inches thick, and those of stone, not less than 6 inches thick.

Fences

Par. 4993. Fences which border on any street, alley or other public way line shall be erected entirely on the owner's property in accordance with the requirements of this Paragraph, and at his expense.

A separate permit is required for the construction, alteration or repair of all fences.

In case of dispute between adjoining property owners over the cost, type of construction of any fence, a permit shall be issued to either party to erect a fence on his own property.

No fence shall be erected more than 8 feet in height, except temporary fences when approved or required by the Buildings Engineer.

Wood fences of tight boards shall not be over 8 feet in height and shall be permitted only in special cases, such as enclosing construction operations, dangerous places and athletic fields.

Wire fences over 3 feet 6 inches in height shall be permitted only upon special approval by the Buildings Engineer.

Wood posts used for fences shall be locust, heart cedar, or any other wood which will resist decay under ground, or which is treated as required in Section 627, not less than 6 inches square at both ends, and set not less than 3 feet in the ground.

Masonry fences shall be designed and constructed in accordance with the regulations governing masonry walls.

All fences shall be designed for a 20 pounds per square foot horizontal pressure over the gross area, in accordance with the requirements of Part VI.

Barbed wire and broken glass, spikes and other sharp objects which may injure persons coming in contact with them shall not be permitted to be used in fences unless they are placed not less than 6 feet 6 inches above ground along the top of the fences.

Hedges shall be permitted on property lines only when requested by both of the adjoining property owners. Once the fence is established, it shall be maintained by one or both owners in accordance with the terms of the permit issued therefor, and never allowed to exceed the maximum height for fences.

All fences shall be kept in proper repair by the owner or owners thereof. The Buildings Engineer shall determine the sufficiency of any fence and he shall also determine the amount and character of repairs required to make any fence safe. Any fences not complying with the provisions of this Section shall be permitted to be repaired only if 50 per cent or more of such fence is in place at the time an application is filed for a permit to repair such fence.

Swimming Pools

Par. 4994. Swimming pools shall be watertight and so constructed as to be easily cleaned. Overflows in the form of continuous troughs shall be provided at the high water lines. The spaces around the pools shall be drained in such a manner as to prevent any water from draining into the pool. All corners of swimming pools shall be rounded.

Swimming pools shall be constructed of structural metal or reinforced concrete lined with non-absorbent material. Steel shall be not less than three-eights of an inch thick. The concrete shall have an ultimate strength of at least 3000 pounds per square inch. Swimming pools shall be designed for all external forces when the pool is empty and for all internal forces when the pool is full. The buoyancy due to ground water shall not be neglected.

Applications for permits for swimming pools shall not be issued without the approval of the Department of Health.

Towers

Par. 4995. All towers shall be securely braced and of sufficient strength to resist the wind pressure for towers, Paragraph 6051, in addition to the loads from the supported structure.

Guy wires to towers shall not cross or encroach upon any street, alley or other public way or cross over or under an exterior electric power wire nor cross any privately owned property without the consent of the owner thereof. All radio towers except those used as an antenna shall be securely grounded with a metal conductor at least equal to a No. 14 U. S. Standard gauge copper wire. The antenna shall meet the requirements of Section 882.

Parking Lots

Par. 4996. Inasmuch as many vacant lots are being used for the storage and parking of motor vehicles, and the use of such lots creates many dangers for pedestrians by the continual crossing of sidewalks by motor vehicles, and, in many cases, the motor vehicles are parked on lots closely abutting on sidewalks without any wall or safeguard to prevent them from running over the sidewalk and into the street at any point, thereby endangering not only pedestrians but adding to the traffic hazards, and in order to secure greater safety, it is necessary that certain regulations be imposed in order to safeguard the public.

The requirements herein shall apply to all lots, other unenclosed property or open structures where motor vehicles are stored or parked and a charge is made for such storage or parking, or where motor vehicles are stored or parked in connection with a commercial enterprise.

A masonry wall alone or together with shrubbery or together with shrubbery and plants, not less than 2 feet in height, and not less than 6 inches thick, or some other adequate barrier, approved by the Buildings Engineer, shall be erected and maintained, except across driveways, on all sides of any such lot, between the sidewalk area and the area of any such lot to be used for the storage or parking of motor vehicles.

No barrier shall be erected on or along such lots which obstructs the vision of pedestrians or the drivers of vehicles traversing or about to traverse any driveway across the building line or sidewalk area.

The entire area of any such lot shall be paved, and kept paved, with a hard or semi-hard dustless surface to be approved by the Buildings Engineer.

The following driveway regulations shall apply to driveways across the building line or in the sidewalk area, but not the driveways on any such lots themselves:

No driveway shall be more than 25 feet wide.

Driveways opening into the same thoroughfare shall be at least 25 feet apart, measured between the nearest sides of the driveways and along the building line.

At corner lots, no part of any driveway opening into any thoroughfare shall be less than 10 feet from the building line of any other intersecting thoroughfare, measured along the building line.

All driveways shall be depressed wherever possible in the judgment of the Highways Engineer; and, if depressed, shall have granite or concrete curbs on the sides, and all such curbs shall be kept painted white. Where driveways are not depressed, a white line, 6 inches wide, shall be kept painted across the entire width of the sidewalk along each side of the driveway.

All driveways shall be constructed in accordance with the specifications of, and to meet the approval of the Highways Engineer.

All decks and ramps or similar structures erected above the ground level on any parking lot to support motor vehicles shall be of three-hour fire-resistive construction and the supporting columns thereof shall be of four-hour fire-resistive construction.

Trailer Camps

Par. 4997. For the purpose of this Code, a "trailer" is defined to be and shall include all portable closed structures or mobile units which are used, or designed to be used, for temporary or permanent living quarters, and a "trailer camp" is defined to be any premises or plot of ground where accommodations are provided for one or more trailers or similar structures.

With every application for a trailer camp there shall be filed a plan showing the layout of such camp to scale and such scale shall not be less than ⅛ inch to a foot, the size and location of all proposed sewers and water lines within the boundary lines of such camp, the proposed general parking arrangement of trailers in such camp, all proposed driveways into and through such camp, and such other information as may be required by the Buildings Engineer to enable him to pass upon such application.

Every trailer camp shall be laid out so that there will be not more than two rows of trailers between any two driveways, and no such driveway shall be less than sixteen feet wide. No ingress or egress over and across a sidewalk shall be more than 25 feet in width, and no such ingress or egress shall be within 10 feet of an intersecting property line or street line.

All driveways shall be paved and kept paved with a hard or semi-hard dustless surface approved by the Buildings Engineer.

All trailers shall be so located in a trailer camp that there shall never be less than 15 feet clear distance between any two trailers or a trailer and another structure, and never less than 10 feet between a trailer and any adjoining property line.

Every trailer camp shall be provided with all the sanitary and mechanical equipment on the basis as given in the following table:

TABLE 4997T

Required Sanitary and Mechanical Equipment in Trailer Camps	Number of Units of Sanitary and Mechanical Equipment required for each 16,000 square feet of Trailer Camp Site Area or fraction thereof		
	Men	Women	General
Laundry Trays			1
Shower Baths	1	1	
Toilets	1	2	
Urinals	1		
Lavatories	1	1	
Drinking Fountains			1
Slop Sinks			1

All such toilet and bathing facilities shall be installed in a building so that no trailer in such camp can be located more than 200 feet therefrom.

Violations of the provisions of this Paragraph 4997 shall be considered safety violations and subject to the penalties prescribed in Paragraph 1922 for violations of the safety regulations of this Code.

Platform Scales

Par. 4998. Platform scales shall meet the approval of the Bureau of Standards of the Mayor and City Council of Baltimore. The pit thereof, scales and other construction shall be constructed in accordance with the applicable provisions of this Code.

Other Miscellaneous Structures

Par. 4999. Miscellaneous structures not specifically mentioned in this Section shall be designed, constructed and maintained in accordance with all of the applicable provisions of this Code, and they shall be subject to the approval of the Buildings Engineer.

PART V

BUILDING TYPE REGULATIONS

Chap. 50—Types of Buildings.
Chap. 51—Type A, Fireproof, Buildings.
Chap. 52—Type B, Fire-Resistant, Buildings.
Chap. 53—Type C, Steel Frame, Buildings.
Chap. 54—Type D, Slow Burning, Buildings.
Chap. 55—Type E, Ordinary, Buildings.
Chap. 56—Type F, Metal, Buildings.
Chap. 57—Type G, Wood Frame, Buildings.
Chap. 58—Type M, Mixed Types of Buildings.
Chap. 59—Fire-Resistive Materials and Construction.

CHAPTER 50

TYPES OF BUILDINGS

Sec. 500—General Requirements for All Types of Buildings.
Sec. 501—Classification of Buildings by Types.
Sec. 508—Existing Types of Buildings.

SECTION 500

GENERAL REQUIREMENTS FOR ALL TYPES OF BUILDINGS

Scope of Construction Types

Par. 5000. This Part includes the minimum fire-resistive requirements of all buildings or other structures and establishes fire-resistive types of buildings or other structures.

References for All Types of Buildings

Par. 5001. For special variations from and restrictions in the types of buildings in the various zones, refer to Part III.

For the permissible height and volume of the various types of buildings and for special requirements and exceptions based on occupancy, refer to Part IV.

For the structural design and other structural requirements, refer to Part VI.

For details of construction not given in this Part, refer to Part VII.

SECTION 501

CLASSIFICATION OF BUILDINGS BY TYPES

Buildings Classified According to Type

Par. 5010. Every existing building or structure for which a certificate is required in accordance with Chapter 15, and every building or structure hereafter erected shall be classified and recorded by the Buildings Engineer as belonging to one of the following types:

Type A—Fireproof Building.
Type B—Fire-resistant Building.
Type C—Steel Frame Building.
Type D—Slow Burning Building.
Type E—Ordinary Building.
Type F—Metal Building.
Type G—Wood Frame Building.
Type M—Mixed Types of Building.

SECTION 508

EXISTING TYPES OF BUILDINGS

Alterations Which Change the Type of Building

Par. 5081. When the type of a building is changed by alterations or additions, the building shall be reclassified, but no alteration shall be permitted which will lower the type below that required by the occupancy and size.

Repairs on Non-Conforming Types of Buildings

Par. 5082. Repairs on buildings and other structures of non-conforming types erected before the passage of this Code shall be permitted unless to maintain such a structure would continue a fire hazard or otherwise be a menace to life and health.

Openings in Walls

Par. 5085. Non-conforming openings or protections thereof in existing walls shall be made to conform on notice from the Buildings Engineer.

CHAPTER 51

TYPE A, FIREPROOF, BUILDINGS

Sec. 510—General Requirements for Type A, Fireproof, Buildings.
Sec. 511—Structural Frame in Type A, Fireproof, Buildings.
Sec. 512—Exterior Walls in Type A, Fireproof, Buildings.
Sec. 513—Roofs on Type A, Fireproof, Buildings.
Sec. 514—Floors in Type A, Fireproof, Buildings.
Sec. 515—Interior Walls in Type A, Fireproof, Buildings.
Sec. 516—Shaftways in Type A, Fireproof, Buildings.
Sec. 517—Stairs in Type A, Fireproof, Buildings.
Sec. 518—Protection of Exterior Openings in Type A, Fireproof, Buildings.
Sec. 519—Interior Finish in Type A, Fireproof, Buildings.

SECTION 510

GENERAL REQUIREMENTS FOR TYPE A, FIREPROOF, BUILDINGS

Scope of Type A, Fireproof, Buildings

Par. 5100. Type A, Fireproof, buildings shall include all buildings or other structures of the highest fire-resistive construction and constructed in accordance with this Chapter.

SECTION 511

STRUCTURAL FRAME IN TYPE A, FIREPROOF, BUILDINGS

General Requirements for the Structural Framing in Type A Buildings

Par. 5110. All structural members in Type A buildings shall be of steel, other structural metals, or reinforced concrete, or both, except that piers and arch ribs may be of solid masonry units.

Columns in Type A Buildings

Par. 5111. The exterior surface of steel or other metal columns placed within the exterior walls or along the outer lines of Type A buildings shall be protected with at least 4 inches of solid brick, stone or concrete masonry, or 6 inches of other masonry, or 4 inches of reinforced concrete. All other sides of such columns shall be protected as required for interior columns.

All interior columns shall be protected by four-hour fire-resistive covering, and such covering shall be of solid masonry units or concrete on columns below the ground level, which are 10 feet or less from a foundation wall.

Trusses and Girders in Type A Buildings

Par. 5112. All steel and other metal trusses and girders in the exterior walls or along the outer lines of Type A buildings shall be protected on the outer surface by not less than 4 inches of masonry or 3 inches of reinforced concrete. The inner surface of such trusses and girders shall be protected as required for interior trusses and girders.

Plates, angles and other members supporting a facing on exterior walls and which are attached to trusses and girders shall have an outer protection of not less than one inch of masonry.

Interior trusses and girders, except roof trusses and girders, shall have all their members protected by a four-hour fire-resistive covering. Such covering shall be of concrete or solid masonry units on trusses and girders below the ground level.

Beams in Type A Buildings

Par. 5113. All steel or other metal beams in exterior walls or along the outer lines of Type A buildings shall be protected on the outer surface by not less than four inches of masonry or 3 inches of reinforced concrete. The inner surface of such beams shall be protected as required for interior beams.

Plates, angles and other members supporting a facing on exterior walls and which are attached to beams shall have an outer protection of not less than one inch of masonry.

Interior beams shall have not lower than four-hour fire-resistive covering, which covering shall be of concrete or solid masonry units on beams below the ground level, except as follows:

All roof beams and purlins shall be as required in Paragraph 5115.

Floor beams having a span not over 20 feet and supporting only floor slabs or panels with an area not exceedinng 150 square feet shall be considered part of the floor system.

Lintels in Type A Buildings

Par. 5114. The lintels over openings in Type A buildings shall be protected as required for beams or girders, except that lintels formed of steel plates, angles or similar structural shapes are not required to be protected on the underside if they are suspended from protected beams or girders, or if they are used over openings not more than 6 feet wide and are supported on masonry.

Stone lintels of more than 4 feet span supporting the masonry over openings shall not be permitted in Type A buildings unless designed and constructed as stone arches.

Roof Framing in Type A Buildings

Par. 5115. All girders or trusses supporting the roof on Type A buildings shall be protected by three-hour fire-resistive covering, except as follows:

a. When no part of such structural members is less than 40 feet from the floor immediately below, no protection of the members is required.

b. When no part of such structural members is less than 30 feet from the floor immediately below, they shall be protected by a covering or a suspended ceiling of one-hour fire-resistive construction.

c. When no part of such structural members is less than 20 feet from the floor immediately below, they shall be protected by a covering or a suspended ceiling of two-hour fire-resistive connstruction.

d. All such members supporting masonry or concrete walls 8 inches or more in thickness, tanks, towers, or similar structures, shall be protected by four-hour fire-resistive covering.

Beams and purlins supporting roof slabs or panels only shall be considered part of the roof system. All roof beams and purlins supporting masonry or concrete walls 8 inches or more in thickness, tanks, towers and similar structures shall have a four-hour fire-resistive covering.

Other Structural Members in Type A Buildings

Par. 5116. All structural members in Type A buildings not included in the foregoing paragraphs shall be protected by two-hour fire-resistive covering, except members subjected to stresses from occasional loads only, such as wind, which shall have a one-hour fire-resistive covering.

Unprotected Structural Members in Type A Buildings

Par. 5118. Auxiliary framework of steel or other incombustible material not connected permanently to the framework of Type A buildings is not required to to protected.

SECTION 512

EXTERIOR WALLS IN TYPE A, FIREPROOF, BUILDINGS

General Requirements for Exterior Walls in Type A Buildings

Sec. 5120. Exterior wall requirements pertain to all walls completely enclosing a Type A building or other structure, including bearing and non-bearing walls, panels and curtain walls, and all cornices, marquees, bays, oriels, outside balconies, porches, platforms and other exterior projections attached thereto.

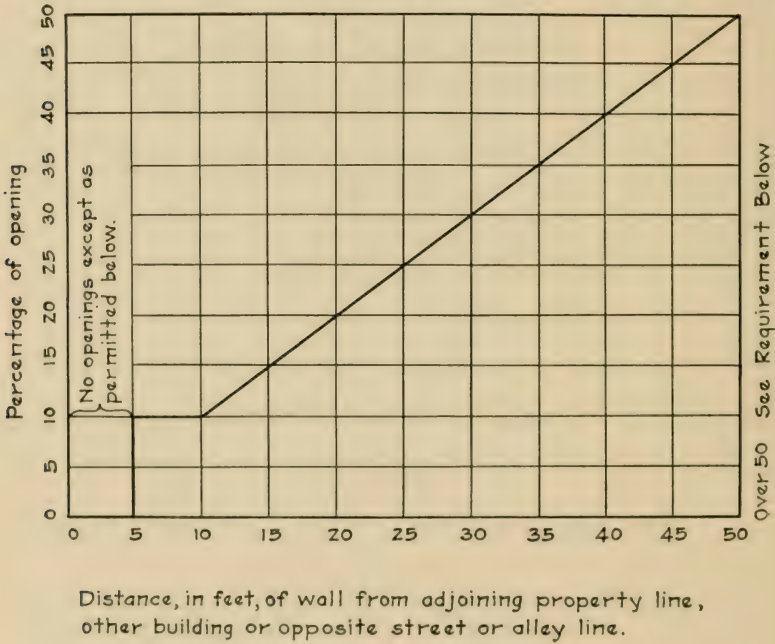
Construction of Exterior Walls in Type A Buildings

Par. 5121. The exterior walls of Type A buildings shall be of masonry or reinforced concrete of four-hour fire-resistive construction.

Openings in Exterior Walls in Type A Buildings

Par. 5122. Where an exterior wall of a Type A building faces a street, alley, adjoining property line or other building, the total area of openings in such wall or a section thereof shall not exceed the areas permitted in the following diagram:

DIAGRAM 5122D



The area of openings shall not be restricted in exterior walls more than 50 feet from an adjoining property line, a building, or an opposite street or alley line.

In exterior walls facing and less than 5 feet from an adjoining property line or a building, door openings not exceeding 25 square feet in area shall be permitted in the first story only, at least 20 feet from any other opening, and there shall be not more than one such opening in each 100-foot length of wall or in a wall whose total length is less than 100 feet, except where the same tenant occupies the areas on each side of the property line or both buildings, in which case, door openings of the same size and spacing shall be permitted in every story.

In exterior walls approximately at right angles to an adjoining property line, no openings shall be permitted within 5 feet of such property line, except as follows:

a. Openings in the first story up to a height of 20 feet shall be permitted not closer than one foot to such property line.

b. In buildings not over 3 stories or 40 feet high, window openings above the first story shall be permitted not closer than 2 feet to such property line.

In the exterior walls facing a court, no opening shall be less than 10 feet from another opening when facing each other, and no opening shall be less than 5 feet from another opening when the planes of such openings are approximately at right angles to each other.

Bays and Oriels in Type A Buildings

Par. 5123. The walls of bays and oriels of Type A buildings shall have the same fire-resistive rating as that required for the exterior walls, except where they are entirely in permitted openings. The roof and floor of such projections shall be constructed as required for the roof and floors of the building.

Loading Platforms on Type A Buildings

Par. 5124. Loading platforms attached to Type A buildings shall be constructed of incombustible materials, except that where they project less than 10 feet from the building they may be of heavy timber constructed as required for the floors of Type D buildings.

All parts of a wooden platform shall be at least 10 feet from any adjoining property line, except that where such platforms are on walls approximately at right angles to a property line, all parts thereof may be not closer than 2 feet from that property line.

Balconies and Porches on Type A Buildings

Par. 5125. The floors of balconies and porches on Type A buildings shall be of incombustible materials, except that where porches and balconies in the first story project not more than 10 feet their floors may be of heavy timber constructed as required for the floors of Type D buildings. The floors and the supports of balconies and porches in the stories above the first shall be of incombustible materials.

The roofs over porches shall be of incombustible materials, except that the roof over a porch in the first story may be of wood.

All parts of wooden porches and balconies shall be at least 10 feet from any adjoining property line, except where such projections are on walls approximately at right angles to a property line, all parts thereof may be not closer than 2 feet from that property line.

Other Projections from Exterior Walls of Type A Buildings

Par. 5126. Cornices, marquees, canopies and similar projections on Type A buildings shall be constructed of substantial incombustible materials.

Parapets on Type A Buildings

Par. 5127. All exterior walls, or portions thereof, of Type A buildings, which walls are 5 feet or less from an adjoining property line shall be extended above the roof thereof to form a parapet, except where the roof is of at least three-hour fire-resistive construction.

The height of such parapets shall be at least 30 inches measured from the roof surface, except that on buildings less than 4 stories and less than 35 feet high, the height of the parapet shall be at least 18 inches.

Exterior Walls Near Other Walls

Par. 5128. The space formed between two walls facing and less than two feet from each other shall be filled solid with concrete or other masonry for a height of not less than 6 inches from the ground level, and enclosed at each end for the full height with a masonry wall. A roof of incombustible materials shall be provided over the space at the top of the lower wall. The expense of such work shall be borne by the owner or owners of the porperty or properties on which the space is located.

SECTION 513

ROOFS ON TYPE A, FIREPROOF, BUILDINGS

General Requirements for Roofs on Type A Buildings

Par. 5130. Roof requirements pertain to the construction of the roofs, the fill on the roofs, the roofing, skylights, bulkheads, penthouses, dormers, spires, steeples, towers and other structures on the roof of Type A buildings.

Roof Framing on Type A Buildings

Par. 5131. The roof framing and supporting members on Type A buildings shall be protected as required in Paragraph 5115.

Roof Construction on Type A Buildings

Par. 5132. The roof slab or the roof system on a Type A building shall have three-hour fire-resistive rating, except as follows:

a. When no part of the roof construction or system is less than 40 feet from the floor immediately below, it may be of incombustible materials with a top slab not less than 2 inches thick.

b. When no part of the roof construction or system is less than 30 feet from the floor immediately below, it may be of incombustible materials having a fire-resistive rating of one hour.

c. When no part of the roof construction or system is less than 20 feet from the floor immediately below, it may have a fire-resistive rating of two hours.

Roofing on Type A Buildings

Par. 5133. All roofing on Type A buildings shall be fire-retardant, and shall be constructed as required in Section 597.

Fill placed on the roof shall be of incombustible material.

Ceilings Under Roofs Over Type A Buildings

Par. 5134. Required ceilings shall be in accordance with Paragraph 5115.

Suspended ceilings in Type A buildings, which are not required under roofs, shall be of incombustible material, except where fire-resistive ceilings are required in Part IV.

This requirement shall be construed to prohibit the use of wooden strips supporting a metal or other incombustible ceiling.

Towers and Steeples on Type A Buildings

Par. 5135. Towers and steeples less than 20 feet from an adjoining property line, on Type A buildings, shall be of three-hour fire-resistive construction.

All other towers and steeples shall be of incombustible materials.

Penthouses on Type A Buildings

Par. 5136. Penthouses and bulkheads on Type A buildings shall be constructed with walls of masonry or reinforced concrete having a two-hour fire-resistive rating, and with a roof having a two-hour fire-resistive rating, covered with a fire-retardant roofing, except that the walls of a penthouse or bulkhead which are within 10 feet of the outside face of an exterior wall shall be not less than 8 inches in thickness and of three-hour fire-resistive construction. Skylights or other openings in the roof of penthouses shall be as required in Paragraph 5138.

Dormers and Monitors on Type A Buildings

Par. 5137. Dormers and monitors on Type A buildings shall be of the same construction as required for the roof of such buildings.

The windows of dormers and monitors shall be at least 10 feet from any adjoining property lines, except that when such windows are approximately at right angles to such lines, the distance shall be not less than 2 feet.

Other Structures on Roofs Over Type A Buildings

Par. 5138. The walls and the framing of skylights, scuttles, and similar structures on the roof of Type A buildings shall be constructed entirely of incombustible materials.

Skylights shall be as required in Section 766.

Such openings in roofs shall not be placed within 5 feet of any adjoining property lines unless surrounded on 3 sides nearest to such lines by walls at least 4 feet high, having the same fire-resistiveness as that of the roof.

SECTION 514

FLOORS IN TYPE A, FIREPROOF, BUILDINGS

Scope of Floors in Type A Buildings

Par. 5140. This Section includes the requirements for the floor finish, the filling under the floor finish, and the construction of all floors in Type A buildings.

Floor Framing in Type A Buildings

Par. 5141. The structural framing supporting the floors in Type A buildings shall be protected as required in Section 511.

Permanent steel or iron forms used in the floor construction need not be covered if they do not enter into the structural design of the floor.

Floor Construction in Type A Buildings

Par. 5142. Any floor construction or system, except mezzanine floors, in Type A buildings, shall have a three-hour fire-resistive rating.

Floors laid on the ground shall be of concrete not less than 3 inches thick or of other masonry not less than 4 inches thick, and shall be sealed tightly to the foundation walls.

Fill on Floors in Type A Buildings

Par. 5143. Where the floor finish is not laid directly on the floor slab in Type A buildings, the space between the floor finish and the slab shall be filled with incombustible material under and for a distance of not less than one foot out from each side of all walls and fixed partitions, and the fill over the balance of the floor area shall be placed so that no unfilled area exceeds 100 square feet, with not less than one foot width of fill separating such areas.

Floor Finish in Type A Buildings

Par. 5144. No wood or other combustible finish shall be permitted on the floors of Type A buildings in hallways, passageways, lobbies, storage rooms, furnace rooms and on floors for similar purposes. All other floor finish shall be of non-flammable materials.

Combustible floor finish shall not extend under interior walls or fixed partitions.

Occupancy Separation Floors in Type A Buildings

Par. 5145. Floors serving as separations between occupancies in Type A buildings shall be of fire-resistive construction as required in Section 407.

Mezzanine Floors in Type A Buildings

Par. 5146. Where the aggregate area of mezzanine floors in any room of a Type A building exceeds 50 per cent of the room area, they shall be constructed as required for the principal floors.

Other mezzanine floors may be constructed as required for wood floors in Type D, Slow Burning, buildings or may be of unprotected steel or other metal. Mezzanine floors as permitted in this Paragraph shall be in not more than one tier.

In existing buildings, no mezzanine shall be permitted to be added to, unless the entire mezzanine conforms with the requirements for such floors.

Ceilings Under Floors of Type A Buildings

Par. 5147. Ceilings in Type A buildings which are not required as part of the floor construction shall be of incombustible materials.

This requirement shall be construed to prohibit the use of wooden strips supporting metal or other incombustible ceilings.

Trap Doors in Floors of Type A Buildings

Par. 5148. Trap doors in floors shall have a fire-resistiveness at least equal to that of Class A fire doors and shall not exceed 40 square feet in area or 10 feet in the greatest dimension.

Trap doors of larger dimensions or areas shall have the same fire-resistiveness as that required for the floors.

SECTION 515

INTERIOR WALLS IN TYPE A, FIREPROOF, BUILDINGS

General Requirements for Interior Walls in Type A Buildings

Par. 5150. Interior wall requirements pertain to all interior fire walls, bearing walls, walls enclosing passageways, walls separating tenancies, fixed and movable partitions, and the protection of openings therein, in Type A buildings.

Interior Fire Walls in Type A Buildings

Par. 5151. Interior fire walls in Type A buildings shall be constructed where required in Part IV and in accordance with Section 598.

Interior Bearing Walls in Type A Buildings

Par. 5152. Interior bearing walls in Type A buildings shall be of four-hour fire-resistive construction.

Walls Enclosing Vertical Shafts in Type A Buildings

Par. 5153. Interior walls enclosing vertical shafts in Type A buildings shall be constructed as required in Section 516.

Walls Enclosing Passageways in Type A Buildings

Par. 5154. The interior walls enclosing passageways in the required exits from a story of a Type A building shall be of three-hour fire-resistive construction.

The openings in such walls shall be protected by Class C fire doors or fire-resistive windows, except as permitted for show windows in Paragraph 7768.

Tenancy Separation Walls in Type A Buildings

Par. 5155. Interior tenancy separation walls in Type A buildings shall be of two-hour fire-resistive construction, unless such walls serve as occupancy separations and a higher rating is required in Section 407.

The openings in tenancy separation walls shall be protected by Class B fire doors.

Fixed Partitions in Type A Buildings

Par. 5156. All fixed partitions in Type A buildings shall be constructed entirely of incombustible materials and shall have a one-hour fire-resistive rating.

Doors in such partitions shall be of hard wood or have the same fire-resistiveness as that of Class C fire doors.

Windows in such partitions shall be of not less than one-quarter inch thick glass in metal sash.

Movable Partitions in Type A Buildings

Par. 5157. Movable partitions in Type A buildings shall be of incombustible material and construction, except that such partitions may be of wood in rooms not over 5000 square feet in area, occupied by one tenant.

SECTION 516

SHAFTWAYS IN TYPE A, FIREPROOF, BUILDINGS

General Requirements for Shaftways in Type A Buildings

Par. 5160. Shaftway requirements pertain to the fire-resistiveness of enclosures of stairwells, interior elevator shafts, ventilation shafts, pipe shafts, light shafts, dumbwaiters, all other shafts and vertical openings in Type A buildings, as are required by Part IV, and of the enclosures for exterior elevator shafts.

Enclosure of Stairwells in Type A Buildings

Par. 5161. The enclosing walls of interior stairways in Type A buildings shall be of three-hour fire-resistive construction.

The openings in such enclosures shall be protected by Class B fire doors, except that openings in an exterior wall of the shaft may be protected as required for exterior openings of the building.

Enclosure of Elevator Shafts in Type A Buildings

Par. 5162. The enclosing walls of vertical openings and shafts for elevators and dumbwaiters in Type A buildings shall be of three-hour fire-resistive construction.

The openings in the enclosures for freight elevators and dumbwaiters shall be protected by Class B fire doors and the openings in the enclosures for passenger elevators shall be protected by Class C fire doors, except that openings in an exterior wall of the shaft may be protected as required for exterior openings of the building.

Enclosure of Ventilation and Light Shafts in Type A Buildings

Par. 5163. The walls of ventilation and light shafts in Type A buildings shall be as required for exterior walls.

Enclosure of Pipe Shafts in Type A Buildings

Par. 5164. The enclosing walls of shafts and vertical openings for pipes, ducts and electric conduits in Type A buildings shall be of two-hour fire-resistive construction, with all openings protected by Class B fire doors.

Fire stops, constructed as required in Paragraph 5916 shall be placed at every floor immediately below door openings in such shafts.

Enclosure of Other Interior Shafts in Type A Buildings

Par. 5165. The enclosing walls of other interior shafts in Type A buildings not included in the previous paragraphs, shall be of three-hour fire-resistive construction, with all openings protected by Class B fire doors, except that openings in an exterior wall of the shaft may be protected as required for exterior openings of the building.

Exterior Elevator Shafts for Type A Buildings

Par. 5168. Exterior passenger or freight elevator shafts attached to Type A buildings, less than 20 feet from any adjoining property line shall be enclosed by walls of not lower than three-hour fire-resistive construction. All other exterior elevator shafts shall be enclosed by walls of incombustible materials.

The exterior openings in such shafts shall be protected as required for exterior openings of the building. The interior openings shall be protected by Class B fire doors.

Ventilators on Shafts in Type A Buildings

Par. 5169. All enclosed shafts in Type A buildings shall be provided with an open ventilator or a skylight in the roof, or with a window in an exterior wall placed near the top of the shaft.

Such ventilator shall have an effective open area equal to at least 10 per cent of the shaft area. The area of the skylight shall be at least 20 per cent, and that of the window not less that 30 per cent of the shaft area. The panes in the skylight and window shall be of single-thick glass.

SECTION 517

STAIRS IN TYPE A, FIREPROOF, BUILDINGS

Construction of Stairs in Type A Buildings

Par. 5171. The stringers, treads, risers and landings of stairs and the ramps in Type A buildings shall be constructed of reinforced concrete, steel, iron or stone.

The steel and iron used in the construction of stairs need not be fireproofed.

Finish on Stairs in Type A Buildings

Par. 5172. Brick, marble, tile, slate, stone, concrete or other hard, incombustible materials shall be used for the finish on treads, or risers in Type A buildings, except that combustible finish, such as linoleum, cork or rubber, may be used if not over one-half inch thick on concrete or stone treads only.

Railing on Stairs in Type A Buildings

Par. 5173. The railing on stairs in Type A buildings shall be constructed of incombustible materials, except that the handrails may be of hard wood.

SECTION 518

PROTECTION OF EXTERIOR OPENINGS IN TYPE A, FIREPROOF, BUILDINGS

General Requirements for Protection of Exterior Openings in Type A Buildings

Par. 5180. This Section includes the requirements for the doors, windows, louvers, and other means of protection for all vertical or horizontal openings in the exterior walls and roofs of Type A buildings.

For protection of openings near the ground, refer to Paragraph 7601.

Exterior Door Openings in Type A Buildings

Par. 5181. Door openings in exterior walls of Type A buildings shall be placed only as permitted in Paragraph 5122.

Door openings in exterior walls facing any adjoining property line, or opposite alley line or another building, shall be protected by Class D fire doors, if they are within 10 feet of such lines or buildings.

Door openings in an exterior wall facing a court or inner yard shall be protected by Class D fire doors if they are within 10 feet of any opening in another wall facing or approximately at right angles to the plane of the door opening.

All other exterior door openings shall be protected by fire doors, metal clad doors, doors of incombustible materials, or hard wood doors.

Exterior Window Openings in Type A Buildings

Par. 5182. Window openings in exterior walls of Type A buildings shall be placed only as permitted in Paragraph 5132.

Window openings in exterior walls facing adjoining property lines or opposite street lines shall be protected by fire-resistive windows, if they are within 10 feet of such lines.

Window openings in an exterior wall facing a court shall be protected by fire-resistive windows if they are within 10 feet of any opening in another wall facing or approximately at right angles to the plane of the window opening.

All exterior window openings more than 125 feet from the ground level and beyond the limits fixed for fire-resistive windows shall be protected by windows constructed of metal or of metal covered wood and glass.

Other window openings shall be protected by windows constructed of glass and wood or of incombustible materials.

Other Exterior Openings in Type A Buildings

Par. 5183. All other exterior openings in Type A buildings shall be protected by incombustible construction, except as follows:

Trap door and other similar openings in roofs shall be protected by a construction having at least the same fire-resistiveness as required for the roof.

Skylights and ventilators, where permitted, shall be as required in Paragraph 5138.

Penthouse doors, windows and other similar openings in the roof structure shall be protected by Class C fire doors or fire-resistive windows.

Exterior openings within such limits where fire doors or fire-resistive windows are required shall be protected by two-hour fire-resistive construction.

Display Windows in Type A Buildings

Par. 5184. The frame, floor finish, shelves, ceilings, apron and all parts of a display window in the first story in the exterior wall of a Type A building may be of wood.

The glass in display windows shall be as required in Paragraph 7653.

SECTION 519

INTERIOR FINISH IN TYPE A, FIREPROOF, BUILDINGS

Scope of Interior Finish in Type A Buildings

Par. 5190. Interior finish in Type A buildings shall include ceiling trim, base boards, wainscoting, picture molds, chair rails, wall paneling, and similar trim for decorative purposes, permanently attached to the building.

Ceiling Trim in Type A Buildings

Par. 5191. Ceiling trim in Type A buildings shall be constructed of non-flammable materials.

Other Interior Trim in Type A Buildings

Par. 5192. Base boards, wainscoting, picture molds and chair rails in Type A buildings shall be of incombustible materials, except in rooms less than 5000 square feet in area, enclosed by fire-resistive walls, where they may be of wood.

Passageways shall not be considered rooms.

Where such trim is of wood, it shall be solidly backed with an incombustible material with no air space behind such trim.

CHAPTER 52

TYPE B, FIRE-RESISTANT, BUILDINGS

Sec. 520—General Requirements for Type B, Fire-Resistant, Buildings.

Sec. 521—Structural Frame in Type B, Fire-Resistant, Buildings.

Sec. 522—Exterior Walls in Type B, Fire-Resistant, Buildings.

Sec. 523—Roofs on Type B, Fire-Resistant, Buildings.

Sec. 524—Floors in Type B, Fire-Resistant, Buildings.

Sec. 525—Interior Walls in Type B, Fire-Resistant, Buildings.

Sec. 526—Shaftways in Type B, Fire-Resistant, Buildings.

Sec. 527—Stairs in Type B, Fire-Resistant, Buildings.

Sec. 528—Protection of Exterior Openings in Type B, Fire-Resistant, Buildings.

Sec. 529—Interior Finish in Type B, Fire-Resistant, Buildings.

SECTION 520

GENERAL REQUIREMENTS FOR TYPE B, FIRE-RESISTANT, BUILDINGS

Scope of Type B, Fire-Resistant, Buildings

Par. 5200. Type B, Fire-resistant, buildings shall include all buildings or other structures of a high fire-resistive nature, and constructed in accordance with the requirements of this Chapter.

SECTION 521

STRUCTURAL FRAME IN TYPE B, FIRE-RESISTANT, BUILDINGS

General Requirements for the Structural Framing in Type B Buildings

Par. 5210. The structural members of Type B buildings shall be of steel, other structural metals, or reinforced concrete, or both, except that piers and arch ribs may be of solid masonry units.

Columns in Type B Buildings

Par. 5211. The exterior surface of steel or other metal columns placed within the exterior walls or along the outer lines of a Type B building shall be protected with at least 4 inches of masonry or 3 inches of reinforced concrete, except where the exterior walls are of other materials permitted in Part IV, in which case the exterior surface shall be protected by a three-hour fire-resistive covering. All other sides of such columns shall be protected as required for interior columns.

All interior columns shall be protected by three-hour fire-resistive covering, and such covering shall be of solid masonry units or concrete on columns below the ground level, which are 10 feet or less from a foundation wall.

Trusses and Girders in Type B Buildings

Par. 5212. All steel or other metal trusses and girders in the exterior walls and along the outer lines of Type B buildings shall be protected on the outer surface by not less than 3 inches of masonry or reinforced concrete, except where the exterior walls are of other materials permitted in Part IV, in which case the exterior surface shall be protected by a three-hour fire-resistive covering. The inner surface of such trusses and girders shall be protected as required for interior trusses and girders.

Plates, angles and other members supporting a facing on exterior walls and which are attached to trusses and girders shall have an outer protection of not less than one inch of masonry.

Interior trusses and girders, except roof trusses and girders, shall have all their members protected by a three-hour fire-resistive covering. Such covering shall be of concrete or solid masonry units on trusses and girders below the ground level.

Beams in Type B Buildings

Par. 5213. All steel or other metal beams in the exterior walls and along the outer lines of Type B buildings shall be protected on the outer surface by not less than 3 inches of masonry or reinforced concrete, except where the exterior walls are of other materials permitted in Part IV, in which case the exterior surface shall be protected by a three-hour fire-resistive covering. The inner surface of such beams shall be protected as required for interior beams.

Plates, angles and other members supporting a facing on exterior walls and which are attached to beams shall have an outer protection of not less than one inch of masonry.

Interior beams shall have a three-hour fire-resistive covering, which covering shall be of concrete or solid masonry units on beams below the ground level, except as follows:

All roof beams and purlins shall be as required in Paragraph 5215.

Beams or joists supporting floor slabs or panels only need not be protected on the underside of the lower flange or may be considered part of the floor system.

Lintels in Type B Buildings

Par. 5214. The lintels over openings in Type B buildings shall be protected as required for beams or girders, except that lintels formed of steel plates, angles or similar structural shapes are not required to be protected on the underside if they are suspended from protected beams or girders, or if they are used over openings not more than 8 feet wide and are supported on masonry.

Stone lintels of more than 4 feet span supporting masonry over openings shall not be permitted in Type B buildings, unless designed and constructed as stone arches.

Roof Framing in Type B Buildings

Par. 5215. All girders and trusses supporting the roof on Type B buildings shall be protected by not lower than two-hour fire-resistive covering, except as follows:

a. When no part of such structural members is less than 30 feet from the floor immediately below, no protection of the members is required.

b. When no part of such structural members is less than 20 feet from the floor immediately below, they shall be protected by a covering or a suspended ceiling of one-hour fire-resistive construction.

c. All such members supporting masonry or concrete walls 8 inches or more in thickness, tanks, towers and similar structures shall be protected by a three-hour fire-resistive covering.

Beams, joists and purlins supporting roof slabs or panels only shall be considered part of the roof system. All such members supporting masonry or concrete walls 8 inches or more in thickness, tanks, towers or similar structures shall have a three-hour fire-resistive covering.

Other Structural Members in Type B Buildings

Par. 5216. All structural members in Type B buildings not included in the foregoing paragraphs shall be protected by one-hour fire-resistive covering.

Unprotected Structural Members in Type B Buildings

Par. 5218. Auxiliary framework of steel or other incombustible material not securely connected to the framework of Type B buildings is not required to be protected.

SECTION 522

EXTERIOR WALLS IN TYPE B, FIRE-RESISTIVE, BUILDINGS

Scope of Exterior Walls in Type B Buildings

Par. 5220. Exterior walls include all walls completely enclosing a Type B building or other structure, including bearing, non-bearing, panel and curtain walls, and all cornices, maquees, bays, oriels, outside balconies, porches, loading platforms, and other exterior projections attached thereto.

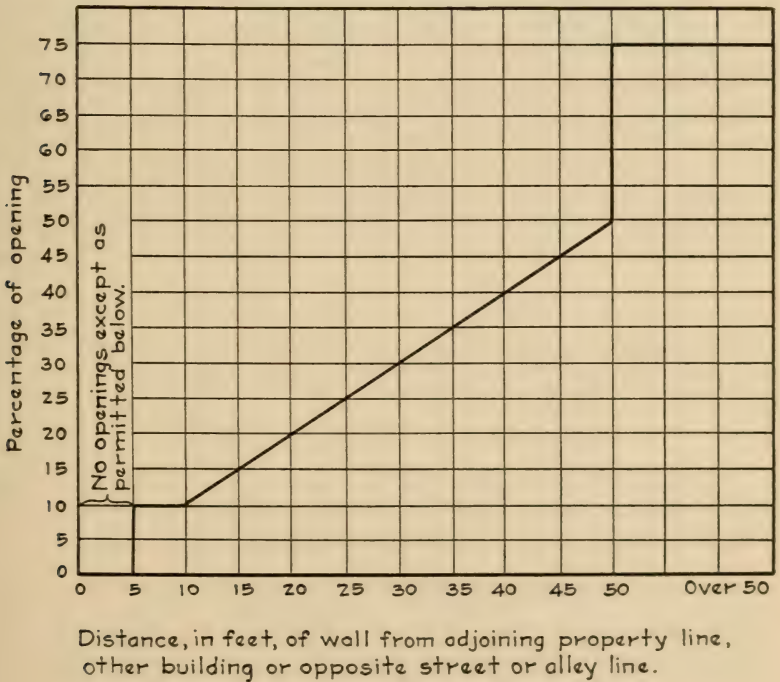
Construction of Exterior Walls in Type B Buildings

Par. 5221. The exterior walls of Type B buildings shall be of masonry or reinforced concrete or of other incombustible materials, and of four-hour fire-resistive construction.

Openings in Exterior Walls of Type B Buildings

Par. 5222. Where an exterior wall of a Type B building faces a street, alley, adjoining property line or other building, the total area of openings in such wall or section thereof shall not exceed the area permitted in the following diagram:

DIAGRAM 5222D



In exterior walls facing and less than 5 feet from an adjoining property line or a building, door openings not exceeding 25 square feet in area shall be permitted in the first story only, at least 20 feet from any other opening, and there shall be not more than one such opening in each 100-foot length of wall or in a wall whose total length is less than 100 feet, except where the same tenant occupies the areas on each side of the property line, or both buildings, in which case door openings of the same size and spacing shall be permitted in every story.

In exterior walls approximately at right angles to an adjoining property line, no openings shall be permitted within 5 feet of such property line, except as follows:

a. Openings in the first story up to a height of 20 feet shall be permitted not closer than one foot to such property line.

b. In buildings not over 3 stories nor 40 feet high, window openings above the first story shall be permitted not closer than 2 feet to such property line.

In the exterior walls enclosing a court, no opening shall be less than 8 feet from another opening when facing each other, and no opening shall be less than 5 feet from another opening when the planes of such openings are approximately at right angles to each other.

Bays and Oriels in Type B Buildings

Par. 5223. The walls of bays and oriels of Type B buildings shall have the same fire-resistive rating as that required for the exterior walls except where they are entirely in permitted openings. The roof and floor of such projections shall be constructed as required for the roof and floors of the building.

Loading Platforms on Type B Buildings

Par. 5224. Loading platforms attached to Type B buildings shall be constructed and located as required for such platforms in Paragraph 5124.

Balconies and Porches on Type B Buildings

Par. 5225. Exterior balconies and porches on Type B buildings shall be constructed and located as required for such projections on Type A buildings in Paragraph 5125.

Other Projections from Exterior Walls of Type B Buildings

Par. 5226. Cornices, marquees, canopies and similar projections on Type B buildings shall be constructed of substantial incombustible materials.

Parapets on Type B Buildings

Par. 5227. All exterior walls, or portions thereof, of Type B buildings, which walls are 5 feet or less from any adjoining property line shall be extended above the roof thereof to form a parapet, except where the roof is of at least three-hour fire-resistive construction.

The height of such parapets shall be at least 30 inches measured from the roof surface, except that on buildings less than 4 stories and less than 35 feet high, the height of the parapet shall be at least 18 inches.

Exterior Walls Near Other Walls

Par. 5228. The space between exterior walls shall be enclosed as required in Paragraph 5128.

SECTION 523

ROOFS ON TYPE B, FIRE-RESISTANT, BUILDINGS

Scope of Roofs on Type B Buildings

Par. 5230. This Section includes the requirements for the construction of the roofs, the roofing, the fill on the roofs, skylights, bulkheads, penthouses, dormers, steeples and towers and other structures on the roof of Type B buildings.

Roof Framing on Type B Buildings

Par. 5231. The roof framing and supporting members on Type B buildings shall be protected as required in Paragraph 5215.

Roof Construction on Type B Buildings

Par. 5232. The roof slab or roof system on a Type B building shall have two-hour fire-resistive rating, except as follows:

a. When no part of the roof construction is less than 30 feet from the floor immediately below, it may be of incombustible materials.

b. When no part of the roof construction is less than 20 feet from the floor immediately below, it may be of incombustible materials having a fire-resistive rating of one hour.

Roofing on Type B Buildings

Par. 5233. All roofing on Type B buildings shall be fire-retardant and shall be constructed as required in Section 597.

Fill placed on the roof shall be of incombustible material.

Ceilings Under Roofs on Type B Buildings

Par. 5234. Required ceilings shall be in accordance with Paragraph 5215.

Suspended ceilings in Type B buildings which are not required under roofs shall be of incombustible material.

This requirement shall be construed to prohibit the use of wooden strips supporting metal or other incombustible ceilings.

Towers and Steeples on Type B Buildings

Par. 5235. Towers and steeples less than 20 feet from an adjoining property line on Type B buildings shall be of two-hour fire-resistive construction.

All other towers and steeples shall be of incombustible materials.

Penthouses on Type B Buildings

Par. 5236. Penhouses and bulkheads on Type B buildings shall be constructed with walls of masonry or reinforced concrete, or with walls of other materials having a two-hour fire-resistive rating, and with a roof having a one-hour fire-resistive rating, covered with a fire-retardant roofing, except that the walls of a penthouse or bulkhead which are within 10 feet of the outside face of an exterior wall shall be not less than 8 inches thick of three-hour fire-resistive construction. Skylights or other openings in the roof of penthouses shall be as required in Paragraph 5238.

Dormers and Monitors on Type B Buildings

Par. 5237. Dormers and monitors on Type B buildings shall be of the same construction as required for the roof of such buildings.

The windows of dormers and monitors shall be at least 10 feet from any adjoining property lines, except that when such windows are approximately at right angles to such lines, the distance shall be not less than 2 feet.

Other Structures on Roofs Over Type B Buildings

Par. 5238. The walls and the framing of skylights, scuttles, and similar structures on the roof of Type B buildings shall be constructed entirely of incombustible materials.

Skylights shall be as required in Section 766.

Such openings in roofs shall not be placed within 5 feet of any adjoining property lines unless surrounded on the three sides nearest to such lines by walls at least 4 feet high, having the same fire-resistiveness as that of the roof.

SECTION 524

FLOORS IN TYPE B, FIRE-RESISTANT, BUILDINGS

Scope of Floors in Type B Buildings

Par. 5240. This Section includes the requirements for the floor finish, the filling under the floor finish and the construction of all floors in Type B buildings.

Floor Framing in Type B Buildings

Par. 5241. The structural framing supporting the floors of Type B buildings shall be protected as required in Section 521.

Permanent steel or iron forms used in the floor construction need not be covered if they do not enter into the structural design of the floor.

Floor Construction in Type B Buildings

Par. 5242. Any floor construction or system, not including mezzanine floors, in Type B buildings shall have a two-hour fire-resistive rating, except that floors below the ground level shall have a three-hour rating.

Floors laid on the ground shall be of concrete not less than 3 inches thick or of other masonry not less than 4 inches thick, and shall be sealed tightly to the foundation walls.

Fill on Floors in Type B Buildings

Par. 5243. Where the floor finish is not laid directly on the floor slab in Type B buildings, the space between the floor finish and the slab shall be filled with incombustible material under and for a distance of one foot out from each side of all walls and fixed partitions.

Floor Finish in Type B Buildings

Par. 5244. No wood or other combustible finish shall be permitted on the floors of Type B buildings in storage rooms, furnace rooms and on floors for similar purposes. All other floor finish shall be of non-flammable materials.

Combustible floor finish shall not extend under interior walls or fixed partitions.

Occupancy Separation Floors in Type B Buildings

Par. 5245. Floors serving as separations between occupancies in Type B buildings shall be of fire-resistive construction, as required in Section 407.

Mezzanine Floors in Type B Buildings

Par. 5246. Where the aggregate area of mezzanine floors in any room of a Type B building exceeds 50 per cent of the room area, they shall be constructed as required for the principal floor.

Other mezzanine floors may be constructed as required for wood floors in Type D, Slow Burning, buildings, or may be of unprotected steel or other metal. Mezzanine floors as permitted in this Paragraph shall be in not more than 2 tiers.

In existing buildings, mezzanine floors shall not be added to unless the entire mezzanine is made to conform to the requirements for new construction.

Ceilings Under Floors in Type B Buildings

Par. 5247. Ceilings in Type B buildings which are not required as part of the floor construction shall be of incombustible materials.

This requirement shall be construed to prohibit the use of wooden strips supporting metal or other incombustible ceilings.

Trap Doors in Floors of Type B Buildings

Par. 5248. Trap doors in floors shall have a fire-resistiveness at least equal to that of Class A fire doors and they shall not exceed 40 square feet in area or 10 feet in any dimension.

Trap doors of larger dimensions or areas shall have the same fire-resistiveness as that required for the floors.

SECTION 525

INTERIOR WALLS IN TYPE B, FIRE-RESISTANT, BUILDINGS

Scope of Interior Walls in Type B Buildings

Par. 5250. This Section includes all interior fire walls, bearing walls, walls enclosing passageways, walls separating tenancies, fixed and movable partitions, and the protection of openings therein in Type B buildings.

Interior Fire Walls in Type B Buildings

Par. 5251. Interior fire walls in Type B buildings shall be constructed where required in Part IV and in accordance with Section 598.

Interior Bearing Walls in Type B Buildings

Par. 5252. Interior bearing walls in Type B buildings shall be of three-hour fire-resistive construction.

Walls Enclosing Vertical Shafts in Type B Buildings

Par. 5253. Interior walls enclosing vertical shafts in Type B buildings shall be constructed as required in Section 526.

Walls Enclosing Passageways in Type B Buildings

Par. 5254. The interior walls enclosing passageways in required exits from a story of a Type B building shall be of two-hour fire-resistive construction.

The openings in such walls shall be protected by Class C fire doors or fire-resistive windows, except as permitted for show windows in Paragraph 7768.

Tenancy Separation Walls in Type B Buildings

Par. 5255. Interior tenancy separation walls in Type B buildings shall be constructed of incombustible materials having a one-hour fire-resistive rating, unless such walls serve as occupancy separations and a higher rating is required in Section 407.

The openings in tenancy separation walls shall be protected by Class B fire doors.

Fixed Partitions in Type B Buildings

Par. 5256. All fixed partitions in Type B buildings shall have a one-hour fire-resistive rating.

Doors in such partitions shall be of hardwood or have the same fire-resistiveness as that of Class C fire doors.

Windows in such partitions shall be of not less than one-quarter inch glass in metal sash.

Movable Partitions in Type B Buildings

Par. 5257. Movable partitions in Type B buildings shall be constructed of non-flammable materials.

SECTION 526

SHAFTWAYS IN TYPE B, FIRE-RESISTANT, BUILDINGS

Scope of Shaftways in Type B Buildings

Par. 5260. This Section includes the requirements for the fire-resistiveness of such enclosures for stairwells, interior elevator shafts, ventilation shafts, pipe shafts, light shafts, dumbwaiters and vertical openings in Type B buildings which are required in Part IV, and of the enclosures for exterior elevator shafts.

Enclosure of Stairwells in Type B Buildings

Par. 5261. The enclosing walls of interior stairwells in Type B buildings shall be of two-hour fire-resistive construction.

The openings in such enclosures shall be protected by Class B fire doors. The openings in an exterior wall of the shaft shall be protected as required for the exterior openings of the building.

Enclosure of Elevator Shafts in Type B Buildings

Par. 5262. The enclosing walls of vertical openings and shafts for elevators and dumbwaiters in Type B buildings shall be of two-hour fire-resistive construction.

The openings in the enclosures for freight elevators and dumbwaiters shall be protected by Class B fire doors and the openings in the enclosures for passenger elevators shall be protected by Class C fire doors, except that openings in an exterior wall of the shaft may be protected as required for exterior openings of the building.

Enclosure of Ventilation and Light Shafts in Type B Buildings

Par. 5263. The walls of ventilation and light shafts in Type B buildings shall be as required for exterior walls.

Enclosure of Pipe Shafts in Type B Buildings

Par. 5264. The enclosing walls of shafts and vertical openings for pipes, ducts and electric conduits in Type B buildings shall be of two-hour fire-resistive construction, with all openings protected by Class B fire doors.

Fire stops, constructed as required in Paragraph 5916, shall be placed at every floor immediately below door openings in such shafts.

Enclosure of Other Interior Shafts in Type B Buildings

Par. 5265. The enclosing walls of other shafts in Type B buildings shall be of two-hour fire-resistive construction, with all openings therein protected by Class B fire doors.

Exterior Elevator Shafts for Type B Buildings

Par. 5268. Exterior passenger or freight elevator shafts, attached to Type B buildings, less than 10 feet from any adjoining property line, shall be enclosed by walls of three-hour fire-resistive construction. All other exterior elevator shafts shall be enclosed by walls of incombustible materials.

The exterior openings in such shafts shall be protected as required for exterior openings of the building. The interior openings shall be protected by Class B fire doors.

Ventilators on Shafts in Type B Buildings

Par. 5269. All enclosed shafts in Type B buildings shall be provided with an open ventilator or a skylight in the roof, or with a window in an exterior wall placed near the top of the shaft.

Such ventilator shall have an effective open area equal to at least 10 per cent of the shaft area. The area of the skylight shall be at least 20 per cent, and that of the window not less than 30 per cent of the shaft area. The panes in the skylight and window shall be of single-thick glass.

SECTION 527

STAIRS IN TYPE B, FIRE-RESISTANT, BUILDINGS

General Requirements for Stairs in Type B Buildings

Par. 5270. All parts of stairs, ramps, the finish on stairs and the railing on stairs in Type B buildings shall be constructed as required in Section 517 for Type A buildings.

SECTION 528

PROTECTION OF EXTERIOR OPENINGS IN TYPE B, FIRE-RESISTANT, BUILDINGS

Scope of Protection of Exterior Openings in Type B Buildings

Par. 5280. This Section includes the requirements for the doors, windows, louvers and other means of protection for all vertical or horizontal openings in the exterior walls and roofs of Type B buildings.

For protection of openings near the ground, refer to Paragraph 7601.

Exterior Doors in Type B Buildings

Par. 5281. Door openings in exterior walls of Type B buildings shall be placed only as permitted in Paragraph 5222.

Door openings in exterior walls facing any adjoining property line, opposite alley line or another building shall be protected by Class D fire doors, if they are within 10 feet of such lines or buildings.

Door openings in an exterior wall facing a court shall be protected by Class D fire doors if they are within 10 feet of any opening in another wall facing or approximately at right angles to the plane of the door opening.

All other exterior door openings shall be protected by wooden doors, metal clad doors, or doors of incombustible materials.

Exterior Windows in Type B Buildings

Par. 5282. Window openings in exterior walls of Type B buildings shall be placed only as permitted in Paragraph 5222.

Window openings in exterior walls facing any adjoining property lines or opposite street lines shall be protected by fire-resistive windows, if they are within 10 feet of such lines.

Window openings in an exterior wall facing a court shall be protected by fire-resistive windows if they are within 10 feet of any opening in another wall facing or approximately at right angles to the plane of the window opening.

All other exterior window openings shall be protected by windows constructed of glass and wood or of incombustible materials.

Other Exterior Openings in Type B Buildings

Par. 5283. All other exterior openings in Type B buildings shall be protected by incombustible construction, except as follows:

Trap doors and other similar openings in roofs shall be protected by a construction having at least the same fire-resistiveness as required for the roof.

Skylights and ventilators, where permitted, shall be as required in Paragraph 5238.

Penthouse doors, windows and other openings in the roof structure shall be protected by Class C fire doors or fire-resistive windows.

Exterior openings within such limits where fire doors or fire-resistive windows are required shall be protected by one-hour fire-resistive construction.

Display Windows in Type B Buildings

Par. 5284. The frame, floor finish, shelves, ceiling, apron and all parts of a display window in the exterior wall of the first story of Type B buildings may be of wood.

The glass in display windows shall be as required in Paragraph 7653.

SECTION 529

INTERIOR FINISH IN TYPE B, FIRE-RESISTANT, BUILDINGS

Scope of Interior Finish in Type B Buildings

Par. 5290. Interior finish in Type B buildings shall include ceiling trim, base boards, wainscoting, picture molds, chair rails, wall paneling, and similar trim for decorative purposes, permanently attached to the building.

Ceiling Trim in Type B Buildings

Par. 5291. Ceiling trim in Type B buildings shall be constructed of non-flammable materials.

Other Interior Trim in Type B Buildings

Par. 5292. Baseboards, wainscoting, picture molds and chair rails in Type B buildings shall be constructed as required in Paragraph 5192, for Type A buildings.

CHAPTER 53

TYPE C, STEEL FRAME, BUILDINGS

Sec. 530—General Requirements for Type C, Steel Frame, Buildings.
Sec. 531—Structural Framing in Type C, Steel Frame, Buildings.
Sec. 532—Exterior Walls in Type C, Steel Frame, Buildings.
Sec. 533—Roofs on Type C, Steel Frame, Buildings.
Sec. 534—Floors in Type C, Steel Frame, Buildings.
Sec. 535—Interior Walls in Type C, Steel Frame, Buildings.
Sec. 536—Shaftways in Type C, Steel Frame, Buildings.
Sec. 537—Stairs in Type C, Steel Frame, Buildings.
Sec. 538—Protection of Exterior Openings in Type C, Steel Frame, Buildings.
Sec. 539—Interior Finish in Type C, Steel Frame, Buildings.

SECTION 530

GENERAL REQUIREMENTS FOR TYPE C, STEEL FRAME, BUILDINGS

Scope of Type C, Steel Frame, Buildings

Par. 5300. Type C, Steel Frame, buildings shall include all buildings or other structures generally having unprotected heavy steel framing wholly or partially enclosed with masonry walls and constructed in accordance with the requirements of this Chapter.

SECTION 531

STRUCTURAL FRAMING IN TYPE C, STEEL FRAME, BUILDINGS

General Requirements for Structural Framing in Type C Buildings

Par. 5310. All structural members in Type C buildings shall be of steel or other structural metal, except that piers or arch ribs may be of masonry. Where the thickness of metal in the structural members is less than that specifically required in this Section, the members shall be protected by a one-hour fire-resistive covering.

Columns in Type C Buildings

Par. 5311. The flanges of unprotected columns in Type C buildings shall be not less than seven-sixteenths inch, and the webs thereof not less than five-sixteenths inch in thickness. All portions of columns below the ground level in contact with earth or in a wall in contact with earth, shall be protected on all sides with not less than 3 inches of concrete, or 4 inches of other solid masonry.

All columns supporting masonry or concrete walls 8 inches or more in thickness, shall be protected by three-hour fire-resistive covering. All trusses, girders and beams which are rigidly connected to such columns shall be protected by a two-hour fire-resistive covering.

Columns supporting one or more floors shall be protected by two-hour fire-resistive covering.

Other columns or portions thereof are not required to be protected.

Trusses and Girders in Type C Buildings

Par. 5312. The thickness of metal in the chord members of unprotected trusses in Type C buildings shall be not less than three-eights of an inch and the thickness of metal in the web members shall be at least five-sixteenths of an inch.

The web, flange angles and plates of unprotected girders shall be at least fixe-sixteenths of an inch in thickness.

Trusses or girders in contact with earth, or in walls in contact with earth shall be protected on all sides with not less than 3 inches of concrete or 4 inches of other solid masonry.

Where unprotected trusses or girders are supported on walls the supports shall be self-releasing.

All trusses and girders supporting masonry or concrete walls 8 inches or more in thickness shall be protected by a four-hour fire-resistive covering.

Beams in Type C Buildings

Par. 5314. The web of unprotected beams in Type C buildings shall be not less than nine-thirty-seconds of an inch thick.

Metal beams in contact with earth or in walls in contact with earth shall be protected by not less than one and one-half inches of concrete or 3 inches of other solid masonry.

Where unprotected beams are supported on walls, the supports shall be self-releasing.

Beams suporting masonry or concrete walls 8 inches or more in thickness shall be protected by a three-hour fire-resistive covering.

Lintels in Type C Buildings

Par. 5315. Steel or other metal lintels supporting masonry in Type C buildings shall be protected as required for lintels in Type B buildings, in Paragraph 5214.

SECTION 532

EXTERIOR WALLS IN TYPE C, STEEL FRAME, BUILDINGS

Scope of Exterior Walls in Type C Buildings

Par. 5320. Exterior walls include all walls completely enclosing a Type C building or other structure, including bearing, non-bearing, panel and curtain walls, and all cornices, marquees, bay windows, oriel windows, outside balconies, porches, loading platforms and other exterior projections attached thereto.

Construction of Exterior Walls in Type C Buildings

Par. 5321. All exterior walls of Type C buildings shall be of masonry or reinforced concrete, or other similar construction, having a four-hour fire-resistive rating, except where otherwise permitted in Part IV.

Openings in Exterior Walls of Type C Buildings

Par. 5322. The total area and location of openings in exterior walls shall be as permitted in Paragraph 5222, for Type B buildings, and they shall be protected as required in Paragraph 5281, for exterior door openings; Paragraph 5282, for exterior window openings; Paragraph 5284, for display windows in Type B buildings, and in Paragraph 5383, for other exterior openings in Type C buildings.

Bays and Oriels in Type C Buildings

Par. 5323. The walls of bays and oriels of Type C buildings shall have the same fire-resistive rating as that required for the exterior walls, except where they are entirely in permitted openings. The roof and floor of such projections shall be constructed as required for the roof and floors of the building.

Platforms on Type C Buildings

Par. 5324. Loading platforms attached to Type C buildings shall be constructed and located as required in Paragraph 5124 for Type A buildings.

Balconies and Porches on Type C Buildings

Par. 5325. Exterior balconies and porches on Type C building shall be constructed and located as required for such projections on Type A buildings in Paragraph 5125.

Other Projections from Exterior Walls of Type C Buildings

Par. 5326. Cornices, marquees, canopies and similar projections on Type C buildings shall be constructed of substantial incombustible materials.

Parapets on Type C Buildings

Par. 5327. All exterior walls, or portions thereof, of Type C buildings which walls are 5 feet or less from any adjoining property line shall be extended above the roof thereof to form a parapet, except where the roof is of at least three-hour fire-resistive construction.

The height of such parapets shall be at least 30 inches measured from the roof surface, except that on buildings less than 4 stories and less than 35 feet high, the height of the parapet shall be at least 18 inches.

Exterior Walls Near Other Walls

Par. 5328. The space between exterior walls shall be enclosed, as required in Paragraph 5128.

SECTION 533

ROOFS ON TYPE C, STEEL FRAME, BUILDINGS

Scope of Requirements for Roofs on Type C Buildings

Par. 5330. This Section includes the requirements for the construction of the roof slabs, the roofing, skylights, bulkheads, penthouses, towers and steeples, and other structures on the roof of Type C buildings.

Roof Framing on Type C Buildings

Par. 5331. The roof framing and supporting members on Type C buildings shall be as required for the structural framing in Section 531.

Roof Construction on Type C Buildings

Par. 5332. The roof system or assembly on Type C buildings shall be of incombustible materials having a one-hour fire-resistive rating, or the roof slabs shall be of incombustible materials at least 2 inches thick, or, where the roof is at least 20 feet from the floor immediately below, of any incombustible material.

Roofing on Type C Buildings

Par. 5333. All roofing on Type C buildings shall be fire-retardant and shall be constructed as required in Section 597.

Ceilings and Spaces Under Roofs on Type C Buildings

Par. 5334. Suspended ceilings, where used under roofs on Type C buildings, shall be of not lower than one-hour fire-resistive construction.

No floors in attics shall be permitted in Type C buildings.

Towers and Steeples on Type C Buildings

Par. 5335. Towers and steeples less than 20 feet from any adjoining property line, on Type C buildings, shall be of two-hour fire-resistive construction. All other towers and steeples shall be of incombustible materials.

Penthouses on Type C Buildings

Par. 5336. Penthouses and bulkheads on the roof of Type C buildings shall have walls of two-hour fire-resistive construction, except that the wall of a penthouse or bulkhead within 10 feet of the outside face of an exterior wall shall be of three-hour fire-resistive construction.

The roof of all penthouses and bulkheads shall be constructed as required for the roof of the building. All such roofs shall be covered with fire-retardant roofing. Skylights and other openings in such roofs shall be as required in Paragraph 5338.

Dormers and Monitors on Type C Buildings

Par. 5337. Dormers and monitors on Type C buildings shall be of the same construction as required for the roof of such buildings.

The windows of dormers and monitors shall be at least 10 fee from any adjoining property lines, except that when such windows are approximately at right angles to such lines, the distance shall be not less than 2 feet.

Other Structures on Roofs Over Type C Buildings

Par. 5338. The walls and the framing of skylights, scuttles and similar structures on the roof of Type C buildings shall be constructed entirely of incombustible materials or of wood covered with metal sheathing.

Skylights shall be as required in Section 766.

Such openings in roofs shall not be placed within 5 feet of any adjoining property lines unless surrounded on the three sides nearest to such lines by walls at least 4 feet high, having the same fire-resistiveness as that of the roof.

SECTION 534

FLOORS IN TYPE C, STEEL FRAME, BUILDINGS

Scope of Floors in Type C Buildings

Par. 5340. This Section includes the requirements for the floor finish, the filling under the floor finish, and the construction of all floors in Type C buildings.

Floor Framing in Type C Buildings

Par. 5341. The structural members supporting the floors in Type C buildings shall be in accordance with Section 531.

Floor Construction in Type C Buildings

Par. 5342. The floor slabs or floor systems in Type C buildings shall be constructed of incombustible materials.

Floors laid on the ground shall be of concrete not less than 3 inches thick or of other masonry not less than 4 inches thick, and shall be sealed tightly to the foundation walls.

Fill on Floors in Type C Buildings

Par. 5343. Fill under the floor finish shall be of incombustible material in Type C buildings.

Floor Finish in Type C Buildings

Par. 5344. The floor finish used in Type C buildings shall be of incombustible materials, except that wood, linoleum, rubber, cork or similar combustible finish shall be permitted on floor construction of not lower than two-hour fire-resistive rating.

Occupancy Separation Floors in Type C Buildings

Par. 5345. Floors serving as separations between occupancies in Type C buildings shall be of fire-resistive construction as required in Section 407.

Mezzanine Floors in Type C Buildings

Par. 5346. Where the aggregate area of mezzanine floors exceeds 50 per cent of the room area in Type C buildings, they shall be constructed of incombustible materials.

Other mezzanine floors may be constructed as required for wood floors in Type D, Slow Burning, buildings. Wooden mezzanine floors shall not be more than in one tier.

Ceilings Under Floors in Type C Buildings

Par. 5347. Ceilings, where used under the floors in Type C buildings, shall be of one-hour fire-resistive construction.

Trap Doors in Floors of Type C Buildings

Par. 5348. Trap doors in floors of Type C buildings shall be either Class A fire doors or have at least the same fire-resistiveness as that of the floors.

SECTION 535

INTERIOR WALLS IN TYPE C, STEEL FRAME, BUILDINGS

Scope of Interior Walls in Type C Buildings

Par. 5350. This Section includes all interior fire walls, bearing walls, walls enclosing passageways, walls separating tenancy, fixed and movable partitions, and the protection of openings therein, in Type C Buildings.

Interior Fire Walls in Type C Buildings

Par. 5351. Interior fire walls in Type C buildings shall be constructed where required in Part IV, and in accordance with Section 598.

Interior Bearing Walls in Type C Buildings

Par. 5352. Interior bearing walls in Type C buildings shall be of three-hour fire-resistive construction.

Walls Enclosing Vertical Shafts in Type C Buildings

Par. 5353. Interior walls enclosing vertical shafts in Type C buildings shall be constructed as required in Section 536.

Walls Enclosing Passageways in Type C Buildings

Par. 5354. The interior walls enclosing passageways in required exits from a story of a Type C building shall be of incombustible construction having a one-hour fire-resistive rating.

The openings in such walls shall be protected by doors and windows having not lower than one-hour fire-resistive rating, except as permitted below.

Where the total area of openings does not exceed 10 per cent of the wall area, or there is no more than one three-foot by seven-foot door opening in such walls to each room, the openings may be protected by one and three-eighths inch solid wood slab doors or by fire-resistive windows.

Show windows in passageways shall be as permitted in Paragraph 7768.

Tenancy Separation Walls in Type C Buildings

Par. 5355. Interior tenancy separation walls in Type C buildings shall be of one-hour fire-resistive construction, unless such walls serve as occupancy separations and a higher rating is required in Section 407.

The openings in tenancy separation walls shall be protected by Class B fire doors.

Fixed Partitions in Type C Buildings

Par. 5356. All fixed partitions in Type C buildings shall be of one-hour fire-resistive construction or of two-inch tongue and grooved planking.

Movable Partitions in Type C Buildings

Par. 5357. Movable partitions in Type C buildings shall be as required for fixed partitions in such buildings or may be constructed of sheet metal, wood or similar light materials.

SECTION 536

SHAFTWAYS IN TYPE C, STEEL FRAME, BUILDINGS

Scope of Shaftways in Type C Buildings

Par. 5360. This section includes the requirements for the fire-resistiveness of enclosures for stairwells, interior elevator shafts, ventilation shafts, pipe shafts, light shafts, dumbwaiters and vertical openings in Type C buildings which are required in Part IV, and of the enclosures for exterior elevator shafts.

Enclosure of Stairwells in Type C Buildings

Par. 5361. The enclosing walls of interior stairwells in Type C buildings shall be of two-hour fire-resistive construction.

The openings in such enclosures shall be protected by Class C fire doors, except that openings in an exterior wall of the shaft may be protected as required for exterior openings of the building.

Enclosures of Elevator Shafts in Type C Buildings

Par. 5362. The enclosing walls of vertical openings and shafts for elevator and dumbwaiters in Type C buildings shall be of two-hour fire-resistive construction.

The openings in such walls shall be protected by Class C fire doors. The openings in an exterior wall of the shaft shall be protected as required for the exterior openings of the building.

Enclosure of Ventilation and Light Shafts in Type C Buildings

Par. 5363. The walls of ventilation and light shafts in Type C buildings shall be as required for exterior walls.

Enclosure of Pipe Shafts in Type C Buildings

Par. 5364. The enclosing walls of shafts and vertical openings for pipes, ducts and electric conduits in Type C buildings shall be of two-hour fire-resistive construction, with all openings protected by Class B fire doors.

Enclosure of Other Interior Shafts in Type C Buildings

Par. 5365. The enclosing walls of other shafts in Type C buildings shall be of one-hour fire-resistive construction, with all openings therein protected by Class C fire doors.

Exterior Elevator Shafts for Type C Buildings

Par. 5368. Exterior elevator shafts, attached to Type C buildings, less than 10 feet from any adjoining property line shall be enclosed by walls of three-hour fire-resistive construction. All other exterior shafts shall be enclosed by walls of incombustible materials.

The exterior openings in such shafts shall be protected as required for exterior openings of the building. The interior openings shall be protected by Class C fire doors.

Ventilators on Shafts in Type C Buildings

Par. 5369. All enclosed shafts in Type C buildings shall be provided with an open ventilator or a skylight in the roof, or with a window in an exterior wall placed near the top of the shaft.

Such ventilator shall have an effective open area equal to at least 10 per cent of the shaft area. The area of the skylight shall be at least 20 per cent, and that of the window not less than 30 per cent of the shaft area. The panes in the skylight and window shall be of single-thick glass.

SECTION 537

STAIRS IN TYPE C, STEEL FRAME, BUILDINGS

Construction of Stairs in Type C Buildings

Par. 5371. The stringers, treads, risers and landings of stairs, and ramps, in Type C buildings, shall be constructed of reinforced concrete, steel or iron, except in buildings less than 4 stories and 45 feet high, where they may be of wood.

The stringers of wooden stairs shall have no dimension less than 4 inches, and treads and risers shall be at least 2 inches thick. Where a ceiling is attached to the soffits of wooden stair stringers, the stairs shall be fire stopped at every floor or landing.

Finish on Stairs in Type C Buildings

Par. 5372. Combustible finish used on stairs in Type C buildings shall not exceed one-half inch in thickness. The thickness of incombustible finish shall not be limited.

Railing on Stairs in Type C Buildings

Par. 5373. The railing of stairs in Type C buildings shall be constructed of incombustible materials, except that the handrail, and in buildings less than 4 stories or 45 feet high, the entire railing, may be of wood.

SECTION 538

PROTECTION OF EXTERIOR OPENINGS IN TYPE C, STEEL FRAME, BUILDINGS

Scope of Protection of Exterior Openings in Type C Buildings

Par. 5380. This Section includes the requirements for the doors, windows, louvers and other means of protection for all vertical or horizontal openings in the exterior walls and roofs of Type C buildings.

For protection of openings near the ground, refer to Paragraph 7601.

Exterior Doors in Type C Buildings

Par. 5381. Door openings in exterior walls of Type C buildings shall be placed only as permitted in Paragraph 5222, for Type B buildings.

Exterior door openings shall be protected as required in Paragraph 5281, for Type B buildings.

Exterior Windows in Type C Buildings

Par. 5382. Window openings in exterior walls of Type C buildings shall be placed only as permitted in Paragraph 5222, for Type B buildings.

Exterior window openings shall be protected as required in Paragraph 5282, for Type B buildings.

Other Exterior Openings in Type C Buildings

Par. 5383. All other exterior openings in Type C buildings shall be protected by incombustible construction, except as follows:

Trap door and other similar openings in roofs shall be protected by a door having at least the same fire-resistive rating, or the same construction, as that of the roof.

Skylights and ventilators where permitted shall be as required in Paragraph 5338.

Penthouse doors, windows and other openings in the roof structure shall be protected by Class C fire doors or fire-resistive windows.

Exterior openings within such limits where fire doors or fire-resistive windows are required shall be protected by one-hour fire-resistive construction.

Display Windows in Type C Buildings

Par. 5384. Display windows on Type C buildings shall be as required in Paragraph 5284 for Type B buildings.

SECTION 539

INTERIOR FINISH IN TYPE C, STEEL FRAME, BUILDINGS

Ceiling Trim in Type C Buildings

Par. 5391. Ceiling trim in Type C buildings shall be constructed of non-flammable materials.

Baseboards and Wainscoting in Type C Buildings

Par. 5392. In Type C buildings for Commercial, Storage or Industrial occupancy, all baseboards and wainscoting shall be of metal, masonry not less than 4 inches thick, concrete or other approved material and construction of equivalent toughness. In such buildings for other occupancies, baseboards and wainscoting shall be in accordance with Paragraph 5393.

Other Interior Trim in Type C Buildings

Par. 5393. Wooden interior trim in Type C buildings shall be solidly backed with an incombustible material with no air-space behind such trim.

CHAPTER 54

TYPE D, SLOW BURNING, BUILDINGS

Sec. 540—General Requirements for Type D, Slow Burning, Buildings.
Sec. 541—Structural Frames in Type D, Slow Burning, Buildings.
Sec. 542—Exterior Walls in Type D, Slow Burning, Buildings.
Sec. 543—Roofs on Type D, Slow Burning, Buildings.
Sec. 544—Floors in Type D, Slow Burning, Buildings.
Sec. 545—Interior Walls in Type D, Slow Burning, Buildings.
Sec. 546—Shaftways in Type D, Slow Burning, Buildings.
Sec. 547—Stairs in Type D, Slow Burning, Buildings.
Sec. 548—Protection of Exterior Openings in Type D, Slow Burning, Buildings.
Sec. 549—Interior Finish in Type D, Slow Burning, Buildings.

SECTION 540

GENERAL REQUIREMENTS FOR TYPE D, SLOW BURNING, BUILDINGS

Scope of Type D, Slow Burning, Buildings

Par. 5400. Type D, Slow Burning, buildings shall include all buildings or other structures generally of heavy timber construction and constructed in accordance with this Chapter.

SECTION 541

STRUCTURAL FRAMES IN TYPE D, SLOW BURNING, BUILDINGS

General Requirements for the Structural Framing in Type D Buildings

Par. 5410. The structural members in Type D buildings shall be of steel, other structural metal, reinforced concrete or wood, except that piers and arches may be of masonry.

Columns in Type D Buildings

Par. 5411. Wood columns in Type D buildings shall have no dimension less than 8 inches. Wood columns shall not support masonry or reinforced concrete except tile or concrete floor finish not more than 3 inches thick. No wood columns shall be permitted to support loads from more than 3 floors and a roof.

Steel, other structural metal, or reinforced concrete columns supporting masonry or concrete walls 8 inches or more in thickness, shall be protected to have a three-hour fire-resistive rating. The lateral bracing of such columns and all trusses, girders and beams rigidly connected to such columns shall have a two-hour fire-resistive covering.

Other structural metal or reinforced concrete columns shall be protected to have a two-hour fire-resistive rating.

Girders and Trusses in Type D Buildings

Par. 5412. Wood girders in Type D buildings or the chord members of wooden trusses shall be solid and have no dimension less than 8 inches or less than 64 square inches in cross-section. The web members of wooden trusses shall have no dimension less than 6 inches or less than 36 square inches in cross-section. Wood girders or trusses shall not support masonry or reinforced concrete except tile or concrete floor finish not more than 3 inches thick.

Where unprotected girders and trusses are supported on walls, the supports shall be of the self-releasing type.

Structural metal or reinforced concrete girders or trusses supporting masonry or concrete walls 8 inches or more in thickness shall be protected by a three-hour fire-resistive covering, except that where such trusses or girders are located below the grade, they shall be protected by at least four-hour fire-resistive covering.

Other structural metal and reinforced concrete girders and trusses shall be protected to have a two-hour fire-resistive rating.

Beams in Type D Buildings

Par. 5414. Wood beams in Type D buildings shall have no dimension less than 6 inches. Wood beams shall have not less than 48 square inches of cross-sectional area if supporting floors, or not less than 36 square inches if supporting roofs. Wood beams shall not support masonry or reinforced concrete, except tile or concrete floor finish not more than 3 inches thick. Where unprotected beams are supported on walls, the supports shall be of the self-releasing type.

Structural metal or reinforced concrete beams supporting masonry or concrete walls 8 inches or more in thickness shall be protected to have a three-hour fire-resistive rating.

Other structural metal and reinforced concrete beams shall be protected to have a one-hour fire-resistive rating.

Lintels in Type D Buildings

Par. 5415. Metal and reinforced concrete lintels in Type D buildings shall be protected as required in Paragraph 5215. Wood lintels shall not be permitted to support masonry, except in interior walls where the span does not exceed 6 feet. Wooden lintels shall have no dimension less than 6 inches and not less than 48 square inches of cross-sectional area.

SECTION 542

EXTERIOR WALLS IN TYPE D, SLOW BURNING, BUILDINGS

Scope of Exterior Walls in Type D Buildings

Par. 5420. Exterior walls include all walls completely enclosing a Type D building or other structure, including bearing, non-bearing, panel and curtain walls, and all cornices, marquees, bays, oriels, outside balconies, porches, loading platforms and other exterior projections attached thereto.

Construction of Exterior Walls in Type D Buildings

Par. 5421. The exterior walls of Type D buildings shall be of masonry or reinforced concrete, or other similar construction, having a four-hour fire-resistive rating.

Openings in Exterior Walls of Type D Buildings

Par. 5422. The total area and location of openings in exterior walls of Type D buildings shall be as permitted in Paragraph 5222, for Type B buildings, and they shall be protected as required in Paragraph 5281, for exterior doors, Paragraph 5282, for exterior windows, Paragraph 5284, for display windows in Type B buildings, and in Paragraph 5483, for other exterior openings in Type D buildings.

Bays and Oriels on Type D Buildings

Par. 5423. The walls of the bays and oriels on Type D buildings shall have the same fire-resistive rating as that required for the exterior walls, except where placed entirely in permitted openings. The roof and floor of such projections shall be constructed as required for the roof and floors of the building.

Loading Platforms on Type D Buildings

Par. 5424. Loading platforms attached to Type D buildings shall be constructed and located as required in Paragraph 5124, for Type A buildings.

Balconies on Type D Buildings

Par. 5425. Exterior balconies and porches on Type D buildings shall be constructed and located as required for such projections on Type A buildings in Paragraph 5125.

Other Projections on Type D Buildings

Par. 5426. Cornices, marquees, canopies and similar projections on Type D buildings shall be constructed of substantial incombustible materials.

Parapets on Type D Buildings

Par. 5427. All exterior walls, or portions thereof, of Type D buildings which walls are 5 feet or less from any adjoining property line shall be extended about the roof thereof to form a parapet, except where the roof is of at least three-hour fire-resistive construction.

The height of such parapets shall be at least 30 inches measured from the roof surface, except than on buildings less than 4 stories and less than 35 feet high, the height of the parapet shall be at least 18 inches.

Exterior Walls Near Other Walls

Par. 5428. The space between exterior walls shall be enclosed, as required in Paragraph 5128.

SECTION 543

ROOFS ON TYPE D, SLOW BURNING, BUILDINGS

Scope of Roofs on Type D Buildings

Par. 5430. This Section includes the requirements for the construction of the roof slab, the roofing, skylights, bulkheads, penthouses, dormers, towers, steeples and other structures on the roofs of Type D buildings.

Roof Framing on Type D Buildings

Par. 5431. The roof framing and supporting members on Type D buildings shall be constructed in conformity with Section 541.

Roof Sheathing on Type D Buildings

Par. 5432. The roof covering on Type D buildings shall be not less than 2 inch tongued and grooved wood sheathing, or shall be of solid lumber placed on edge securely spiked together to form a roof at least 3 inches in thickness, except that where the roof is more than 20 feet from the floor immediately below, it may be of not less than No. 24 U. S. Standard gauge metal sheathing.

Wood roof sheathing shall not extend through required parapet walls.

Any roof system or assembly having a one hour fire-resistive rating shall also be permitted on Type D buildings.

Roofing on Type D Buildings

Par. 5433. All roofing on Type D buildings shall be fire-retardant and shall be constructed as required in Section 597.

Ceilings and Spaces Under Roofs on Type D Buildings

Par. 5434. Suspended ceilings shall not be permitted under roofs on Type D buildings, except in special locations approved by the Buildings Engineer, in which case they shall be of one-hour fire-resistive construction and shall be suspended from the rafters or roof beams.

Floors shall not be permitted in attic spaces.

Towers and Steeples on Type D Buildings

Par. 5435. Towers and steeples less than 20 feet from any adjoining property line, on Type D buildings, shall be of incombustible material or of wood covered entirely with an incombustible material.

Penthouses on Type D Buildings

Par. 5436. Penthouses and bulkheads on the roof of Type D buildings shall have walls of one-hour fire-resistive construction. Where a wall of a penhouse or bulkhead is within 10 feet of the outside face of an exterior wall, it shall be constructed as required for the exterior walls of the building, except where the exterior wall of the building is extended 2 feet beyond either side and above the roof of the penthouse, such wall of the penthouse may be of one-hour fire-resistive construction.

The roof of all penthouses and bulkheads shall be constructed as required for the roof of the building. All such roofs shall be covered with fire-retardant roofing. Skylights and other openings in such roofs shall be as required in Paragraph 5438.

Dormers and Monitors on Type D Buildings

Par. 5437. Dormers and monitors on Type D buildings shall be of the same construction as required for the roof of such buildings.

The windows of dormers and monitors shall be at least 10 feet from any adjoining property lines, except that when such windows are approximately at right angles to such lines, the distance shall be not less than 2 feet.

Other Structures on Roofs Over Type D Buildings

Par. 5438. The walls and the framing of skylights, scuttles and similar structures on the roof of Type D buildings shall be constructed entirely of incombustible materials or of wood covered with metal sheathing.

Skylights shall be in accordance with the requirements of Section 766.

Such openings in roofs shall not be placed within 5 feet of any adjoining property lines unless surrounded on the three sides nearest to such lines by walls of at least 4 feet high, having the same fire-resistiveness as that of the roof.

SECTION 544

FLOORS IN TYPE D, SLOW BURNING, BUILDINGS

Scope of Floors in Type D Buildings

Par. 5440. This Section includes the requirements for the floor finish, the fill under the floor finish, and the construction of all floors in Type D buildings.

Floor Framing in Type D Buildings

Par. 5441. The structural members supporting the floors in Type D buildings shall be in accordance with Section 541.

Floor Construction in Type D Buildings

Par. 5442. The floors above the ground level in Type D buildings shall be of 2-inch or more tongued and grooved or splined wood planking with a top layer of at least 1-inch thick flooring; or of solid timber placed on edge, securely spiked together to form a floor at least 3 inches thick; or of any wooden flooring having at least an equal strength and fire-resistiveness.

Floors below the ground level shall be of two-hour fire-resistive construction.

Floors laid on the ground shall be of concrete not less than 3 inches thick or of other masonry not less than 4 inches thick, and shall be sealed tightly to the foundation walls.

Fill on Floors in Type D Buildings

Par. 5443. No combustible fill shall be permitted under the floor finish in Type D buildings.

Floor Finish in Type D Buildings

Par. 5444. No wood or other combustible finish shall be permitted on the floors of Type D buildings in storage rooms, furnace rooms and on floors for similar purposes. All other floor finishes shall be of non-flammable materials.

Combustible finish shall not extend under interior walls and fixed partitions.

Occupancy Separation Floors in Type D Buildings

Par. 5445. Floors serving as separations between occupancies in Type D buildings shall be of fire-resistive construction as required in Section 407.

Mezzanine Floors in Type D Buildings

Par. 5446. Mezzanine floors in Type D buildings shall be of the same construction as required for the principal floors.

Ceilings Under Floors in Type D Buildings

Par. 5447. Suspended ceilings shall not be permitted under floors in Type D buildings, except in special locations approved by the Buildings Engineer, in which case they shall be of one-hour fire-resistive construction.

Trap Doors in Floors of Type D Buildings

Par. 5448. Trap doors in floors of Type D buildings shall be either Class A fire doors or have at least the same fire-resistiveness as that of the floors.

SECTION 545

INTERIOR WALLS IN TYPE D, SLOW BURNING, BUILDINGS

Scope of Interior Walls in Type D Buildings

Par. 5450. This Section includes all interior fire walls, bearing walls, walls enclosing passageways, walls separating tenancy, fixed and movable partitions, and the protection of openings therein in Type D buildings.

Interior Fire Walls in Type D Buildings

Par. 5451. Interior fire walls in Type D buildings shall be constructed where required in Part IV and in accordance with Section 598.

Interior Bearing Walls in Type D Buildings

Par. 5452. Interior bearing walls in Type D buildings shall be of two-hour fire-resistive construction.

Walls Enclosing Vertical Shafts in Type D Buildings

Par. 5453. Interior walls enclosing vertical shafts in Type D buildings shall be constructed as required in Section 546.

Walls Enclosing Passageways in Type D Buildings

Par. 5454. The interior walls enclosing passageways in required exits from a story of Type D buildings shall be of one-hour fire-resistive construction or of wood.

Where such walls are of wood, they shall be constructed either of two layers of at least one inch thick matched boards or of at least two inch thick tongued and grooved planking or of solid laminated wood not less than four inches thick.

The openings in such walls shall be protected by doors constructed as required for the walls or by fire-resistive windows, except that where the aggregate area of openings does not exceed 10 per cent of the wall area, or there is no more than one 3-foot by 7-foot door opening in such wall to each room, the openings may be protected by one and three-eighths inch thick solid wood slab doors, and except as permitted for show windows, in Paragraph 7768.

Tenancy Separation Walls in Type D Buildings

Par. 5455. Interior tenancy separation walls in Type D buildings shall be constructed as required in Paragraph 5454, for walls enclosing passageways, except that no combustible walls shall be permitted below the grade. Where such walls serve as occupancy separations they shall have a fire-resistive rating required in Section 407.

All openings in such walls shall be protected by Class B fire doors or fire-resistive windows.

Fixed Partitions in Type D Buildings

Par. 5456. All fixed partitions in Type D buildings shall be constructed as required in Paragraph 5454, for walls enclosing passageways.

The openings in such partitions may be protected by any kind of doors or windows.

Movable Partitions in Type D Buildings

Par. 5457. Movable partitions in Type D buildings shall be either as required for fixed partitions in such buildings or constructed of sheet metal, wood or similar light materials.

SECTION 546

SHAFTWAYS IN TYPE D, SLOW BURNING, BUILDINGS

Scope of Shaftways in Type D Buildings

Par. 5460. This Section includes the requirements for the construction of enclosures for stairwells, interior elevator shafts, ventilation shafts, pipe shafts, light shafts, dumbwaiters and vertical openings in Type D buildings as are required in Part IV, and of the enclosures for exterior elevator shafts.

Enclosure of Stairwells in Type D Buildings

Par. 5461. The enclosing walls of interior stairwells in Type D buildings shall be of two-hour fire-resistive construction.

The openings in such enclosures shall be protected by Class C fire doors, except that openings in an exterior wall of the shaft may be protected as required for exterior openings of the building.

Enclosures of Elevator Shafts in Type D Buildings

Par. 5462. The enclosing walls of vertical openings and shafts for elevators and dumbwaiters in Type D buildings shall be of two-hour fire-resistive construction.

The openings in such walls shall be protected by Class C fire doors. The openings in an exterior wall of the shaft shall be protected as required for the exterior openings of the building.

Enclosure of Ventilation and Light Shafts in Type D Buildings

Par. 5463. The walls of ventilation and light shafts in Type D buildings shall be as required for exterior walls.

Enclosure of Pipe Shafts in Type D Buildings

Par. 5464. The enclosing walls of shafts and vertical openings not exceeding 16 square feet in area for pipes, ducts and electric conduits in Type D buildings shall be of one-hour fire-resistive construction. The walls of other pipe shafts shall be the same as required for elevator shafts.

Openings in such walls shall be protected by Class B fire doors.

Enclosure of Other Interior Shafts in Type D Buildings

Par. 5465. The enclosing walls of other shafts in Type D buildings shall be of one-hour fire-resistive construction, with the openings therein protected by Class D fire doors.

Exterior Elevator Shafts for Type D Buildings

Par. 5468. Exterior passenger or freight elevator shafts attached to Type D buildings less than 10 feet from any adjoining property line shall be enclosed by walls of three-hour fire-resistive construction. All other exterior elevator shafts shall be enclosed by walls of incombustible materials.

The exterior openings in such shafts shall be protected as required for the exterior openings of the building. The interior openings shall be protected by Class B fire doors.

Ventilators on Shafts in Type D Buildings

Par. 5469. All enclosed shafts in Type D buildings shall be provided with an open ventilator or a skylight in the roof, or with a window in an exterior wall placed near the top of the shaft.

Such ventilator shall have an effective open area equal to at least 10 per cent of the shaft area. The area of the skylight shall be at least 20 per cent, and that of the window not less than 30 per cent of the shaft area. The panes in the skylight and window shall be of single-thick glass.

SECTION 547

STAIRS IN TYPE D, SLOW BURNING, BUILDINGS

General Requirements for Stairs in Type D Buildings

Par. 5470. All parts of stairs, ramps, the finish on stairs and the railing on stairs in Type D buildings shall be constructed as required in Section 537 for Type C buildings.

SECTION 548

PROTECTION OF EXTERIOR OPENINGS IN TYPE D, SLOW BURNING, BUILDINGS

Scope of Protection of Exterior Openings in Type D Buildings

Par. 5480. This Section includes the requirements for the doors, windows, louvers, and other means of protection for all vertical or horizontal openings in the exterior walls and roofs of Type D buildings.

For protection of openings near the ground, refer to Paragraph 7601.

Exterior Doors in Type D Buildings

Par. 5481. Door openings in exterior walls of Type D buildings shall be placed only as permitted in Paragraph 5222 for Type B buildings.

Exterior door openings shall be protected as required in Paragraph 5281 for Type B buildings.

Exterior Windows in Type D Buildings

Par. 5482. Window openings in exterior walls of Type D buildings shall be placed only as permitted in Paragraph 5222 for Type B buildings.

Exterior window openings shall be protected as required in Paragraph 5282, for Type B buildings.

Other Exterior Openings in Type D Buildings

Par. 5483. Other openings in the exterior walls of Type D buildings shall be protected by incombustible construction or by not less than 4-inch solid laminated wood construction covered on the weather side with incombustible materials, except as follows:

> Trap door and other similar openings in roofs shall be protected by a door having at least the same fire-resistive rating, or the same construction as that of the roof.
>
> Skylights and ventilators where permitted shall be as required in Paragraph 5438.
>
> Penthouse door, window and other openings in the roof structure shall be protected by Class C fire doors or fire-resistive windows.
>
> Exterior openings within such limits where fire doors or fire-resistive windows are required shall be protected by one-hour fire-resistive construction.

Display Windows in Type D Buildings

Par. 5486. Display windows on Type D buildings shall be as required in Paragraph 5284 for Type B buildings.

SECTION 549

INTERIOR FINISH IN TYPE D, SLOW BURNING, BUILDINGS

Ceiling Trim in Type D Buildings

Par. 5491. Ceiling trim in Type D buildings shall be of non-flammable material.

Baseboards and Wainscoting in Type D Buildings

Par. 5492. In Type D buildings for Commercial, Storage or Industrial occupancy, all baseboards and wainscoting shall be of metal, masonry not less than 4 inches thick, concrete or other approved material and construction of equivalent toughnes. In such buildings for other occupancies, baseboards and wainscoting shall be of non-flammable material.

Other Interior Trim in Type D Buildings

Par. 5493. Other interior trim in Type D buildings shall be of non-flammable material.

CHAPTER 55

TYPE E, ORDINARY, BUILDINGS

Sec. 550—General Requirements for Type E, Ordinary, Buildings.
Sec. 551—Structural Frame in Type E, Ordinary, Buildings.
Sec. 552—Exterior Walls in Type E, Ordinary, Buildings.
Sec. 553—Roofs on Type E, Ordinary, Buildings.
Sec. 554—Floors in Type E, Ordinary, Buildings.
Sec. 555—Interior Walls in Type E, Ordinary, Buildings.
Sec. 556—Shaftways in Type E, Ordinary, Buildings.
Sec. 557—Stairs in Type E, Ordinary, Buildings.
Sec. 558—Protection of Exterior Openings in Type E, Ordinary, Buildings.
Sec. 559—Interior Finish in Type E, Ordinary, Buildings.

SECTION 550

GENERAL REQUIREMENTS FOR TYPE E, ORDINARY, BUILDINGS

Scope of Type E, Ordinary, Buildings

Par. 5500. Type E, Ordinary, buildings shall include buildings or other structures generally of wood frame construction enclosed with masonry walls and constructed in accordance with this Chapter.

SECTION 551

STRUCTURAL FRAME IN TYPE E, ORDINARY, BUILDINGS

General Requirements for the Structural Framing in Type E Buildings

Par. 5510. The structural framing in Type E buildings shall be of structural metal, reinforced concrete, or wood, except that at piers or arches may be of masonry.

Wooden structural members shall not be permitted to support masonry or reinforced concrete, except tile floor finish not more than 3 inches thick, and except as permitted for wooden lintels in Paragraph 5515.

Columns in Type E Buildings

Par. 5511. Structural metal or reinforced concrete columns supporting concrete or masonry walls 8 inches or more in thickness in Type E buildings shall be protected with three-hour fire-resistive covering. The lateral bracing of such columns and all trusses, girders and beams rigidly connected to such columns shall have a two-hour fire-resistive covering.

Other structural metal and wood columns need not be protected.

Wood columns shall not be permitted to support loads from more than 4 floors and a roof.

Trusses and Girders in Type E Buildings

Par. 5512. Structural metal or reinforced concrete trusses or girders supporting masonry or concrete walls 8 inches or more in thickness in Type E buildings shall be protected by three-hour fire-resistive covering, except that where such trusses or girders are located below the grade, they shall be protected by at least four-hour fire-resistive covering.

Other structural metal, reinforced concrete and wooden trusses or girders, need not be protected, except as required for roofs in Paragraph 5534.

Where unprotected trusses and girders are supported on walls, the supports shall be of the self-releasing type.

Beams in Type E Buildings

Par. 5514. Structural metal or reinforced concrete beams more than 10 feet in span supporting masonry or concrete walls 8 inches or more in thickness in Type E buildings shall be protected by three-hour fire-resistive covering, except that where such beams are located below the grade, they shall be protected by four-hour fire-resistive covering.

Other structural metal, reinforced concrete or wooden beams need not be protected, except as required for roofs in Paragraph 5534.

Wood beams shall have no dimension less than 3 inches, and joists, no dimension less than 2 inches.

Where unprotected beams are supported on walls, the supports shall be of the self-released type.

Lintels in Type E Buildings

Par. 5515. Metal lintels supporting masonry in Type E buildings shall be protected as required for Type B buildings in Paragraph 5214. Wood lintels shall not be permitted except over openings, not exceeding 6 feet in width, in interior walls.

SECTION 552

EXTERIOR WALLS IN TYPE E, ORDINARY, BUILDINGS

Scope of Exterior Walls in Type E Buildings

Par. 5520. Exterior walls include all walls completely enclosing a Type E building or other structure, including bearing, non-bearing, panel and curtain walls, and all cornices, marquees, bays, oriels, outside balconies, porches, loading platforms and other exterior projections attached thereto.

Construction of Exterior Walls in Type E Buildings

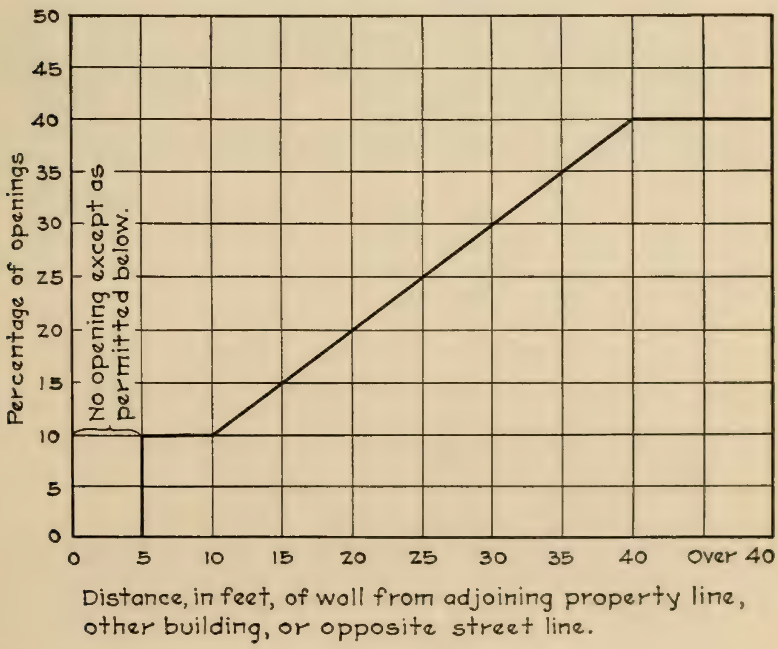
Par. 5521. The exterior walls of Type E buildings shall be of masonry or reinforced concrete of four-hour fire-resistive construction.

For exceptions to this requirement, refer to Part IV, and for special exceptions relating to the walls of projections on Dwellings, refer to Paragraph 4313.

Openings in Exterior Walls of Type E Buildings

Par. 5522. Where an exterior wall of a Type E building faces a street, alley, adjoining property line or other building, the total area of openings in such wall or section thereof shall not exceed the area permitted in the following diagram:

DIAGRAM 5522D



In exterior walls facing and less than 5 feet from an adjoining property line or a building, door openings not exceeding 25 square feet in area shall be permitted in the first story only, at least 20 feet from any other opening, and there shall be not more than one such opening in each 100 feet length of wall, or in a wall whose total length is less than 100 feet, except where the same tenant occupies the areas on each side of the property line, or both buildings, in which case door openings of the same size and spacing shall be permitted in every story.

In exterior walls approximately at right angles to an adjoining property line, no openings shall be permitted within 5 feet of such property line, except as follows:

a. Openings in the first story up to a height of 20 feet shall be permitted not closer than one foot to such property line in all buildings.

b. In buildings not over 3 stories or 40 feet high, window openings above the first story shall be permitted not closer than 2 feet to such property line.

In the exterior walls facing a court, no opening shall be less than 8 feet from another opening when facing each other, and no opening shall be less than 5 feet from another opening when the planes of such openings are approximately at right angles to each other.

Bays and Oriels in Type E Buildings

Par. 5523. The walls of bays and oriels on Type E buildings shall have the same fire-resistive rating as that required for the exterior walls except where they are entirely in permitted openings. The roof and floor of such projections shall be constructed as required for the roof and floors of the building.

Loading Platforms on Type E Buildings

Par. 5524. Loading platforms attached to Type E buildings shall be constructed and located as required in Paragraph 5124 for Type A buildings.

Balconies and Porches on Type E Buildings

Par. 5525. The floors, roofs, and their supports, of exterior balconies and porches on Type E buildings shall be of incombustible materials, except that they may be of wood if they project less than 10 feet and are placed not higher than the level of the third floor of the building.

All parts of such balconies or porches shall be at least 18 inches from any adjoining property line, except that where the length of the side facing the property line of such balconies or porches is 10 feet or more, the distance of all parts thereof from the property line shall be 18 inches plus 7 inches for every foot or fraction thereof by which the length exceeds 10 feet, but such distance need never be more than 10 feet. Exceptions to these rules are porches in front and at the first floor of row houses, which may be constructed continuous. Where two or more porches or balconies face an adjoing property line, they shall be considered one unit for the purpose of the above rules.

Enclosed porches shall be considered parts of the building, except as regulated for Dwellings in Paragraph 4313, and except as permitted for continuous porches in Paragraph 2791.

Other Projections from Type E Buildings

Par. 5526. Cornices, marquees, canopies and similar projections more than 35 feet above the ground level, on Type E buildings, shall be constructed of steel or other incombustible materials.

Parapets on Type E Buildings

Par. 5527. All exterior walls, or portions thereof, of Type E buildings which walls are facing and which are 10 feet or less from an adjoining property line and all party walls shall be extended above the roof thereof to form a parapet, except where the roof is of at least three-hour fire-resistive construction, and except on buildings not over 3 stories or 35 feet high where the roof is of incombustible construction for a distance of not less than 10 feet on either side of the property line, or where such roofs are covered with slate or asbestos shingles such parapet walls may be stopped directly under the incombustible roof covering.

The height of such parapets shall be at least 30 inches measured from the roof surface, except that on buildings less than 4 stories and less than 35 feet high the height of parapets shall be at least 12 inches.

Exterior Walls Near Other Walls

Par. 5528. The space between exterior walls shall be enclosed, as required in Paragraph 5128.

SECTION 553

ROOFS ON TYPE E, ORDINARY, BUILDINGS

Scope of Roofs on Type E Buildings

Par. 5530. This Section includes the requirements for the construction of the roof slab, the roofing, dormers, skylights, bulkheads, penthouses, towers, steeples, and other structures on the roofs of Type E buildings.

Roof Framing on Type E Buildings

Par. 5531. The roof framing and supporting members on Type E buildings shall be constructed in conformity with Section 551.

Purlins or rafters supporting the roof shall have no dimension less than 2 inches.

Roof Construction on Type E Buildings

Par. 5532. The roof covering on Type E buildings shall be of not less than three-quarter inch wood sheathing or of metal sheathing not less than No. 24 United States Standard gauge, or any construction of a higher fire-resistiveness.

Roofing on Type E Buildings

Par. 5533. All roofing on Type E buildings shall be fire-retardant and constructed as required in Section 597.

Ceilings Under Roofs on Type E Buildings

Par. 5534. The roofs on Type E buildings over 3 stories or 40 feet in height shall be protected by ceilings of one-hour fire-resistive construction, except where the roofs have at least a one-hour fire-resistive rating. Where ceilings are used under the roofs of other Type E buildings, they shall not be of flammable materials.

Towers and Steeples on Type E Buildings

Par. 5535. Towers and steeples less than 20 feet from an adjoining property line, on Type E buildings, shall be of incombustible material or of wood covered entirely with an incombustible material. Other towers may be of wood.

Penthouses on Type E Buildings

Par. 5536. Penthouses and bulkheads on Type E buildings shall have walls of one-hour fire-resistive construction.

The roof of all penthouses and bulkheads shall be constructed as required for the roof of the building. Skylights and other openings in such roofs shall be as required in Paragraph 5438.

Where the wall of a penthouse or bulkhead is within 10 feet of the outside face of an exterior wall, it shall be constructed as required for exterior walls of the building, except where the exterior wall of the building is extended 2 feet beyond either side and above the roof of the penthouse, such wall of the penthouse may be of one-hour fire-resistive construction.

Dormers and Monitors on Type E Buildings

Par. 5537. Dormers and monitors on Type E buildings shall be constructed as required for the roof of such buildings.

The windows of dormers and monitors shall be at least 10 feet from any adjoining property lines, except that when such windows are approximately at right angles to such lines, the distance shall be not less than 2 feet.

Other Structures on Roofs Over Type E Buildings

Par. 5538. Skylights, scuttles and similar structures on the roof of Type E buildings and the windows in the skylights shall be constructed and located as required in Paragraph 5438 for Type D buildings.

Attics and Roof Spaces on Type E Buildings

Par. 5539. The attics under roofs of Type E buildings constructed of wood or the space between a ceiling and such roofs shall be divided into horizontal areas of not more than 2500 square feet. The partitions dividing these areas shall extend for the full height of the attic or roof space and shall be constructed of at least one-inch matched wood planking or of incombustible material. All openings in these partitions shall be protected by self-closing doors constructed of materials at least as fire-resistive as the partition.

SECTION 554

FLOORS IN TYPE E, ORDINARY, BUILDINGS

Scope of Floors in Type E Buildings

Par. 5540. This Section includes the requirements for the floor finish and floor construction in Type E buildings.

Floor Framing in Type E Buildings

Par. 5541. The structural members supporting the floors in Type E buildings shall be in accordance with Section 551.

Wooden joists supporting floors shall have no dimension less than 2 inches.

Floor Construction in Type E Buildings

Par. 5542. The floors in Type E buildings shall be of not less than 13/16 inch tongued and grooved flooring on wood joists not more than 16 inches on centers or other construction permitted in higher types of buildings, except that all floors which are below the ground level shall be of one-hour fire-resistive construction.

Floors in contact with the soil shall be either of concrete not less than 3 inches thick or of other masonry not less than 4 inches thick, and shall be sealed tightly to the foundation walls.

Occupancy Separation Floors in Type E Buildings

Par. 5545. Floors serving as separations between occupancies in Type E buildings shall be of fire-resistive construction as required in Section 407.

Ceilings Under Floors in Type E Buildings

Par. 5547. Ceilings, when used under floors in Type E buildings, shall be of non-flammable material.

Trap Doors in Floors of Type E Buildings

Par. 5548. Trap doors in floors of Type E buildings shall have at least the same fire-resistiveness or construction as that of the floor.

SECTION 555

INTERIOR WALLS IN TYPE E, ORDINARY, BUILDINGS

Scope of Interior Walls in Type E Buildings

Par. 5550. This Section includes all interior fire walls, bearing walls, walls enclosing passageways, walls separating tenancy, fixed and movable partitions, and the protection of openings therein in Type E buildings.

Interior Fire Walls in Type E Buildings

Par. 5551. Interior fire walls in Type E buildings shall be constructed where required in Part IV and in accordance with Section 598.

Interior Bearing Walls in Type E Buildings

Par. 5552. Interior bearing walls in Type E buildings shall be of two-hour fire-resistive construction, except that where they support not more than 3 floors and a roof, they may be of one-hour fire-resistive construction.

Walls Enclosing Vertical Shafts in Type E Buildings

Par. 5553. Interior walls enclosing vertical shafts in Type E buildings shall be constructed as required in Section 556.

Walls Enclosing Passageways in Type E Buildings

Par. 5554. The interior walls enclosing passageways in required exits from a story of a Type E building shall be of one-hour fire-resistive construction.

The openings in such walls shall be protected by Class C fire doors or fire-resistive windows, except that where the aggregate area of openings does not exceed 10 per cent of the wall area, or there is no more than one 3-foot by 7-foot door opening in such wall to each room, the openings may be protected by one and three-eighths inch thick solid wood slab doors, and except as permitted for show windows in Paragraph 7768.

Tenancy Separation Walls in Type E Buildings

Par. 5555. Interior tenancy separation walls in Type E buildings more than 3 stories or 40 feet in height shall be of one-hour fire-resistive construction, with all openings protected by one and three-eighths inch solid wood slab door or by doors of at least equal fire-resistiveness.

Where such walls serve as occupancy separations, they shall have a fire-resistive rating as required in Section 407.

Fixed Partitions in Type E Buildings

Par. 5556. All bearing partitions in Type E buildings may be of any construction permitted except that fixed partitions located below the ground level shall be of one-hour fire-resistive construction.

Movable Partitions in Type E Buildings

Par. 5557. Movable partitions in Type E buildings shall not be constructed of flammable materials.

SECTION 556

SHAFTWAYS IN TYPE E, ORDINARY, BUILDINGS

Scope of Shaftways in Type E Buildings

Par. 5560. This Section includes the requirements for the construction of enclosures for stairwells, interior elevator shafts, ventilation shafts, pipe shafts, light shafts, dumbwaiters and vertical openings in Type E buildings as are required in Part IV, and of the enclosures for exterior elevator shafts.

Enclosure of Stairwells in Type E Buildings

Par. 5561. The enclosing walls of interior stairways in Type E buildings shall be of two-hour fire-resistive construction, with all openings therein protected by Class C fire doors, except as follows:

a. Such walls in dwellings more than 2 stories or 30 feet in height or 30,00 cubic feet in volume but not more than 4 stories or 45 feet high, or not more than 100,000 cubic feet in volume shall be of one-hour fire-resistive construction. The openings in such walls shall be protected by one and three-eighth inch thick solid wood slab doors, or by doors of equal fire-resistiveness. No special enclosure walls are required in Dwellings of such type buildings not over two stories or 30 feet in height, or 30,000 cubic feet or less in volume.

b. Openings in an exterior wall of the shaft shall be protected as required for the exterior openings of the building.

Enclosure of Elevator Shafts in Type E Buildings

Par. 5562. The enclosing walls of vertical openings and shafts for elevators and dumbwaiters in Type E buildings shall be of two-hour fire-resistive construction, except that such walls in the stories above the basement in buildings not over 3 stories or 40 feet high may be of one-hour fire-resistive construction.

The openings in the interior walls of elevator shafts shall be protected by Class C fire doors.

The openings in the interior walls of dumbwaiters in all Type E institutions and private assembly buildings, and in dwellings more than 3 stories or 40 feet high shall be protected by Class C fire doors.

The openings in the exterior walls of such shafts shall be protected as required for the exterior openings of the building.

Enclosure of Ventilation and Light Shafts in Type E Buildings

Par. 5563. The walls of ventilation and light shafts in Type E buildings shall be as required for exterior walls.

Enclosure of Pipe Shafts in Type E Buildings

Par. 5564. The enclosing walls of shafts and vertical openings for ducts, electric conduits and pipes in Type E buildings shall be of one-hour fire-resistive construction.

Openings in such walls shall be protected by Class B fire doors.

Enclosure of Other Interior Shafts in Type E Buildings

Par. 5565. The enclosing walls of other shafts in Type E buildings shall be of one-hour fire-resistive construction, with the openings therein protected by Class D fire doors.

Exterior Elevator Shafts for Type E Buildings

Par. 5568. Exterior passenger or freight elevator shafts attached to Type E buildings, less than 10 feet from any adjoining property line, shall be enclosed by walls of three-hour fire-resistive construction. All other exterior elevator shafts shall be enclosed by walls of incombustible materials.

The exterior openings in such shafts shall be protected as required for the exterior openings of the building. The interior openings shall be protected by Class C fire doors.

Ventilators on Shafts in Type E Buildings

Par. 5569. All enclosed shafts in Type E buildings shall be provided with an open ventilator or a skylight in the roof, or with a window in an exterior wall placed near the top of the shaft.

Such ventilator shall have an effective open area equal to at least 10 per cent of the shaft area. The area of the skylight shall be at least 20 per cent, and that of the window not less than 30 per cent of the shaft area. The panes in the skylight and window shall be of single-thick glass.

SECTION 557

STAIRS IN TYPE E, ORDINARY, BUILDINGS

Protection of Stairs in Type E Buildings

Par. 5571. The underside of enclosed wooden stairways in Type E buildings shall be protected by a ceiling of one-hour fire-resistive construction attached to the soffits of the stringers. The concealed space so formed shall be fire stopped at every landing.

Finish on Stairs in Type E Buildings

Par. 5572. The thickness of combustible finish on stairs in Type E buildings, such as linoleum, cork or rubber, shall not exceed one-half inch.

SECTION 558

PROTECTION OF EXTERIOR OPENINGS IN TYPE E, ORDINARY, BUILDINGS

Scope of Protection of Exterior Openings in Type E Buildings

Par. 5580. This Section includes the requirements for the doors, windows, louvers and the protection of all vertical or horizontal openings in the exterior walls and roofs in Type E buildings.

For protection of openings near the ground, refer to Paragraph 7601.

Exterior Doors in Type E Buildings

Par. 5581. Door openings in exterior walls of Type E buildings shall be placed only as permitted in Paragraph 5522.

Exterior door openings shall be protected as required in Paragraph 5281, for Type B buildings.

Exterior Windows in Type E Buildings

Par. 5582. Window openings in exterior walls of Type E buildings shall be placed only as permitted in Paragraph 5522.

Exterior window openings shall be protected as required in Paragraph 5282, for Type B buildings, except that display windows may be constructed as permitted in Paragraph 5584.

Other Exterior Openings in Type E Buildings

Par. 5583. Other openings in the exterior walls of Type E buildings shall be protected by incombustible construction, or by not less than 4-inch solid laminated wood construction covered on the weather side with incombustible materials, except as follows:

Skylights and ventilators, where permitted, shall be as required in Paragraph 5438.

Penthouse door openings shall be protected by metal clad doors and penthouse window openings shall be protected by windows of incombustible materials.

Exterior openings within such limits where fire doors or fire-resistive windows are required shall be protected by one-hour fire-resistive construction.

Display Windows in Type E Buildings

Par. 5584. The frame, shelves, apron and all parts of a display window in the exterior wall of Type E buildings may be of wood, provided that the display window is not over 2 stories high.

The glass in display windows shall be as required in Paragraph 7653.

SECTION 559

INTERIOR FINISH IN TYPE E, ORDINARY, BUILDINGS

Ceiling Trim in Type E Buildings

Par. 5591. The ceiling trim in Type E buildings shall be of non-flammable material.

Other Trim in Type E Buildings

Par. 5593. Baseboards, wainscoting and similar trim in Type E buildings shall be of non-flammable materials, except that in such buildings for Commercial, Storage or Industrial occupancy all baseboards and wainscoting shall be of metal or other approved material of equivalent toughness.

CHAPTER 56

TYPE F, METAL, BUILDINGS

Sec. 560—General Requirements for Type F, Metal, Buildings.
Sec. 561—Structural Frame in Type F, Metal, Buildings.
Sec. 562—Exterior Walls in Type F, Metal, Buildings.
Sec. 563—Roofs in Type F, Metal, Buildings.
Sec. 564—Floors in Type F, Metal, Buildings.
Sec. 565—Interior Walls in Type F, Metal, Buildings.
Sec. 566—Shaftways in Type F, Metal, Buildings.
Sec. 567—Stairs in Type F, Metal, Buildings.
Sec. 568—Protection of Exterior Openings in Type F, Metal, Buildings.
Sec. 569—Interior Finish in Type F, Metal, Buildings.

SECTION 560

GENERAL REQUIREMENTS FOR TYPE F, METAL, BUILDINGS

Scope of Type F, Metal, Buildings

Par. 5600. Type F, Metal, buildings shall include all buildings or other structures constructed in accordance with the requirements of this Chapter.

SECTION 561

STRUCTURAL FRAME IN TYPE F, METAL, BUILDINGS

General Requirements for Structural Framing in Type F Buildings

Par. 5610. All structural members in Type F buildings shall be of structural metal or other incombustible material. No protection of the structural steel or other metal is required.

SECTION 562

EXTERIOR WALLS IN TYPE F, METAL, BUILDINGS

Scope of Exterior Walls in Type F Buildings

Par. 5620. This Section is intended to cover all walls completely enclosing a Type F building or other structure, and all cornices, marquees, balconies, loading platforms and other exterior projections attached thereto.

Construction of Exterior Walls in Type F Buildings

Par. 5621. The exterior walls of Type F buildings shall be supported on foundation walls, piers or columns of masonry or reinforced concrete, or of wood treated as required in Section 627. Such foundation walls shall extend at least 18 inches above the ground level, unless the exterior walls are of metal constructed reasonably tight.

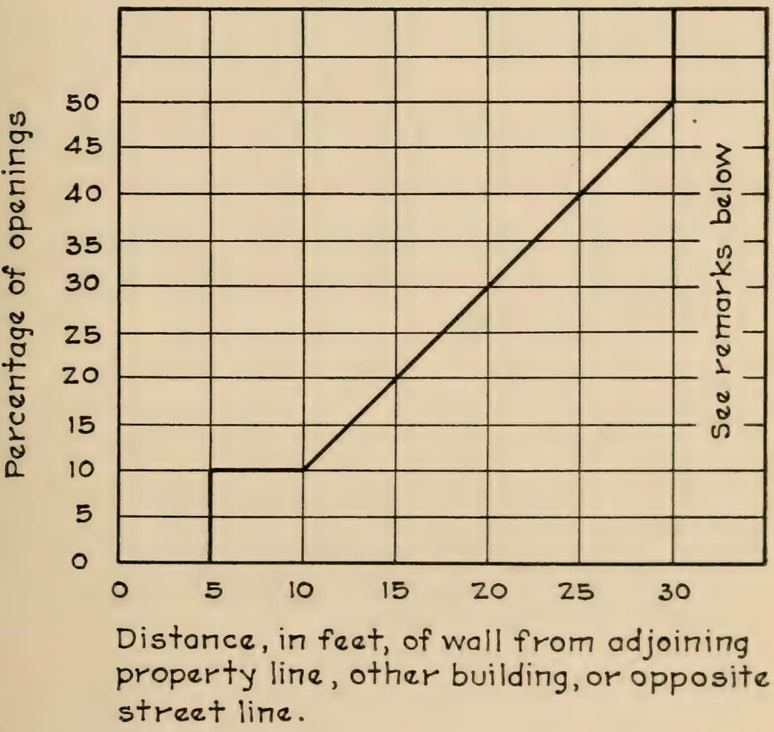
Exterior walls of Type F buildings shall be of galvanized iron or other non-corroding metal, or metal protected against corrosion, not less than No. 26 United States Standard Gauge, or of asbestos not less than one-quarter inch thick, or of other incombustible material having at least an equal strength. No such wall or part thereof shall be built within 5 feet from an adjoining property line, or other buildings, except where otherwise regulated in Part III.

Where hollow spaces are formed in the exterior wall, they shall be firestopped at every floor and roof level, as required in Paragraph 5916.

Openings in Exterior Walls in Type F Buildings

Par. 5622. Where an exterior wall of a Type F building faces a street, alley, or an adjoining property line, the total area of openings in such wall or portion thereof shall not exceed the areas permitted in the following diagram:

DIAGRAM 5622D



The area of openings shall not be restricted in exterior walls more than 30 feet from an adjoining property line, a building, or an opposite street or alley line.

Loading Platforms on Type F Buildings

Par. 5624. Exterior loading platforms on Type F buildings shall be constructed of incombustible materials or of heavy timber.

The distance of such platforms from any adjoining property lines shall be as required in Paragraph 5124 for Type A buildings.

Balconies and Porches on Type F Buildings

Par. 5625. Exterior balconies and porches on Type F buildings shall be constructed and located as required in Paragraph 5525 for Type E buildings.

Other Projections from Type F buildings

Par. 5628. Cornices, marquees and similar projections on Type F buildings shall be constructed of metal or other incombustible materials.

SECTION 563

ROOFS ON TYPE F, METAL, BUILDINGS

Scope of Roofs on Type F Buildings

Par. 5630. This Section includes the requirements for the construction of the roof slab, the roofing, skylights, bulkheads, penthouses, towers, steeples and other structures on the roofs of Type F buildings.

Roof Framing on Type F Buildings

Par. 5631. The structural members supporting the roof on Type F buildings shall be as required in Paragraph 5610.

Roof Sheathing on Type F Buildings

Par. 5632. The roof sheathing on Type F buildings shall be of metal or other incombustible material.

Metal roofs not covered by roofing shall be non-corroding, or protected against corrosion.

Roofing on Type F Buildings

Par. 5633. All roofing on Type F buildings shall be fire-retardant and constructed as required in Section 597.

Ceilings Under Roofs on Type F Buildings

Par. 5634. Ceilings, where used, under the roofs of Type F buildings, shall be constructed of incombustible materials.

Towers and Steeples on Type F Buildings

Par. 5635. All parts of the towers and steeples on the roofs of Type F buildings shall be constructed as required for the building.

Penthouses on Roofs Over Type F Buildings

Par. 5636. The walls and the structural framing of penthouses and bulkheads on Type F buildings shall be entirely of metal or other incombustible materials.

The roof of penthouses and bulkheads shall be constructed as required for the roof of the building.

Other Structures on Roofs Over Type F Buildings

Par. 5638. Skylights, scuttles and similar structures on the roof of Type F buildings and the windows in the skylights shall be constructed and located as required in Paragraph 5438 for Type D buildings.

SECTION 564

FLOORS IN TYPE F, METAL, BUILDINGS

Scope of Floors in Type F Buildings

Par. 5640. This Section includes the requirements for the construction of floors, the floor finish and the ceilings under floors in Type F buildings.

Floor Framing in Type F Buildings

Par. 5641. The structural members supporting the floors in Type F buildings shall be as required in Paragraph 5610.

Floor Construction in Type F Buildings

Par. 5642. The floors in Type F buildings shall be constructed of metal or other incombustible materials, except that the first floor above the ground level may be of wood, constructed as required in Section 544, for Type E buildings.

Floors in contact with the soil shall be of concrete not less than 3 inches thick or other masonry not less than 4 inches thick and shall be sealed tightly to the foundation walls.

Occupancy Separation Floors in Type F Buildings

Par. 5645. Floors serving as separations between occupancies in Type F buildings shall be of fire-resistive construction, as required in Section 407.

Ceilings Under Floors in Type F Buildings

Par. 5646. Ceilings, where used, under the floors of Type F buildings, shall be constructed of incombustible materials.

Trap Doors in Floors of Type F Buildings

Par. 5648. Trap doors in floors of Type F buildings shall have the same fire-resistiveness as that of the floor.

SECTION 565

INTERIOR WALLS IN TYPE F, METAL, BUILDINGS

Scope of Interior Walls in Type F Buildings

Par. 5650. This Section includes the requirements for all interior walls, partitions and the protection of openings therein in Type F buildings.

Interior Fire Walls in Type F Buildings

Par. 5651. Interior fire walls in Type F buildings shall be constructed where required in Part IV and in accordance with Section 598.

Interior Bearing and Other Walls in Type F Buildings

Par. 5652. Interior walls, bearing walls, and walls enclosing passageways in required exits of Type F buildings, separating tenancies, and fixed partitions shall be constructed entirely of incombustible materials or shall be of not lower than one-hour fire-resistive construction, except that no combustible material shall enter into the construction of interior walls or partitions which are below the ground level.

The openings in walls enclosing passageways in required exits from a story shall be protected by metal doors, metal clad doors or by windows constructed of incombustible materials.

Walls Enclosing Vertical Shafts in Type F Buildings

Par. 5654. Interior walls enclosing vertical shafts in Type F buildings shall be constructed as required in Section 566.

Firestopping Interior Walls in Type F Buildings

Par. 5655. Where hollow spaces are formed in interior walls in Type F buildings, they shall be firestopped at every floor and roof level, as required in Paragraph 5916.

Movable Partitions in Type F Buildings

Par. 5657. Movable partitions in Type F buildings shall not be constructed of flammable materials.

SECTION 566

SHAFTWAYS IN TYPE F, METAL, BUILDINGS

Scope of Shaftways in Type F Buildings

Par. 5660. This Section includes the requirements for the construction of enclosures for stairwells, interior elevator shafts, ventilation shafts, pipe shafts, light shafts, dumbwaiters and vertical openings in Type F buildings, as are required in Part IV, and of the enclosures for exterior elevator shafts.

Interior Shaftways in Type F Buildings

Par. 5661. The enclosing walls of all interior shafts in Type F buildings shall be of not lower than one-hour fire-resistive construction.

The openings in the interior walls of elevator shafts and stairwells shall be protected by Class C fire doors.

Exterior Elevator Shafts in Type F Buildings

Par. 5668. Exterior passenger and freight elevator shafts attached to Type F buildings less than 10 feet from any adjoining property line shall be enclosed by walls of not lower than one-hour fire-resistive construction.

All other exterior elevator shafts shall be enclosed by walls of incombustible materials.

The exterior openings in such shafts shall be protected as required for the exterior openings of the building. The interior openings shall be protected by metal door or metal clad wooden doors.

SECTION 567

STAIRS IN TYPE F, METAL, BUILDINGS

Construction of Stairs in Type F Buildings

Par. 5671. The stairs in Type F buildings shall be constructed of reinforced concrete, steel, iron, or wood.

Railing on Stairs in Type F Buildings

Par. 5673. The railing of the stairs in Type F buildings may be constructed of wood.

SECTION 568

PROTECTION OF EXTERIOR OPENINGS IN TYPE F, METAL, BUILDINGS

Scope of Protection of Exterior Openings in Type F Buildings

Par. 5680. This Section includes the requirements for the doors, windows, louvers and the protection of all vertical or horizontal openings in the exterior walls and roofs in Type F buildings.

For protection of openings near the ground, refer to Paragraph 7601.

Exterior Doors in Type F Buildings

Par. 5681. Door openings in exterior walls of Type F buildings shall be placed only as permitted in Paragraph 5622.

All exterior door openings shall be protected by metal doors or metal clad doors, except that exterior doors which are more than 10 feet from any adjoining property line or another building may be of wood.

Exterior Windows in Type F Buildings

Par. 5682. Window openings in exterior walls of Type F buildings shall be placed only as permitted in Paragraph 5622.

All exterior window openings shall be protected by windows constructed of incombustible materials, except that the sash and frame of exterior windows which are more than 10 feet from any adjoining property line may be of wood.

Other Exterior Openings in Type F Buildings

Par. 5683. Other openings in exterior walls of Type F buildings shall be protected by incombustible materials.

Trap doors in the roof shall be constructed of the same materials as required for the roof.

Skylights and ventilators, where permitted, shall be as required in Paragraph 5438, for Type D buildings.

Penthouse door, window and other openings in the roof shall be protected by metal doors, metal-clad wooden doors or by windows of incombustible materials.

Display Windows on Type F Buildings

Par. 5684. Display windows on Type F buildings shall be as permitted in Paragraph 5584, for Type E buildings.

SECTION 569

INTERIOR FINISH IN TYPE F, METAL, BUILDINGS

Interior Trim in Type F Buildings

Par. 5691. Ceiling trim, wainscoting, picture molds and similar interior trim in Type F buildings shall be of metal or other approved material of equivalent toughness.

CHAPTER 57

TYPE G, WOOD FRAME, BUILDINGS

Sec. 570—General Requirements for Type G, Wood Frame, Buildings.
Sec. 571—Structural Frame in Type G, Wood Frame, Buildings.
Sec. 572—Exterior Walls in Type G, Wood Frame, Buildings.
Sec. 573—Roofs on Type G, Wood Frame, Buildings.
Sec. 574—Floors in Type G, Wood Frame, Buildings.
Sec. 575—Interior Walls in Type G, Wood Frame, Buildings.
Sec. 576—Shaftways in Type G, Wood Frame, Buildings.
Sec. 577—Stairs in Type G, Wood Frame, Buildings.
Sec. 578—Protection of Exterior Openings in Type G, Wood Frame, Buildings.
Sec. 579—Interior Finish in Type G, Wood Frame, Buildings.

SECTION 570

GENERAL REQUIREMENTS FOR TYPE G, WOOD FRAME, BUILDINGS

Scope of Type G, Wood Frame, Buildings

Par. 5700. Type G, Wood Frame, buildings shall include all buildings or other structures generally of wood or other combustible construction and built in accordance with the requirements of this Chapter.

SECTION 571

STRUCTURAL FRAME IN TYPE G, WOOD FRAME, BUILDINGS

Structural Members in Type G Buildings

Par. 5711. The members in the structural framework of Type G buildings may be of any material and construction conforming to the requirements of this Code.

Wood joists or rafters shall have no dimension less than 2 inches except in special prefabricated panel construction, when approved by the Buildings Engineer.

SECTION 572

EXTERIOR WALLS IN TYPE G, WOOD FRAME, BUILDINGS

Scope of Exterior Walls in Type G Buildings

Par. 5720. Exterior walls include all walls enclosing a Type G building or other structure and all cornices, balconies, marquees, platforms, porches, and all other similar projections attached thereto.

Construction of Exterior Walls of Type G Buildings

Par. 5721. The exterior walls of Type G buildings shall be supported on foundation walls, piers or columns of masonry or reinforced concrete, or of wood treated as required in Section 627. Such foundation walls shall extend at least 18 inches above the ground level, except that the sheathing, shingles or weatherboarding of the exterior wall may be extended down to within 6 inches of the ground level.

All exterior wood frame walls shall be firestopped at every floor and roof level for the entire length of the wall. The firestopping shall be as required in Paragraph 5916.

No parts of an exterior wood frame wall shall be less than 10 feet from any adjoining property line, except as permitted for bays and oriels in Paragraph 5723, and except if otherwise regulated in Part III.

Openings in Exterior Walls of Type G Buildings

Par. 5722. There are no restrictions for the number of area of openings in exterior walls of Type G buildings.

Bays and Oriels on Type G Buildings

Par. 5723. The walls of bays and oriels on Type G buildings shall be constructed as required for the exterior walls of the building. The roof and floor of such projections shall be constructed as required for the roof and floors of the building. No part of bays or oriels shall be located within 5 feet of an adjoining property line.

Platforms, Balconies and Porches on Type G Buildings

Par. 5724. The floors of exterior platforms, balconies and porches on Type G buildings shall be constructed as permitted for the floors thereof.

The roof of such projections shall be of any construction permitted by this Code.

The distance of open wooden balconies and porches from any adjoining property lines shall be as required for such projections on Type E buildings in Paragraph 5525.

Enclosed porches shall be considered parts of the building.

The distance of loading platforms from any adjoining property lines shall be as required in Paragraph 5124 for Type A buildings.

Other Projections from Type G Buildings

Par. 5728. Cornices, canopies and similar projections on Type G buildings shall be constructed of wood or incombustible materials.

SECTION 573

ROOFS ON TYPE G, WOOD FRAME, BUILDINGS

Scope of Roofs on Type G Buildings

Par. 5730. This Section includes the requirements for roof sheathing, roofing, skylights, bulkheads, penthouses, towers, steeples, attics, ceilings under roofs, and all other similar construction forming a part of roofs on Type G buildings.

Roof Framing on Type G Buildings

Par. 5731. The structural framing supporting the roof on Type G buildings shall be as required in Paragraph 5711.

Roof Sheathing on Type G Buildings

Par. 5732. The roof sheathing on Type G buildings may be of any construction permitted by this Code.

Roofing on Type G Buildings

Par. 5733. The roofing on Type G buildings shall be fire-retardant, except that wooden shingles, as specified in Paragraph 5975, shall be permitted on such buildings where all parts thereof are at least 20 feet from any adjoining property line, opposite street line or other buildings having ordinary roofing or wooden shingle roofing.

Attics and Roof Spaces on Type G Buildings

Par. 5734. Attics and spaces under wooden roofs on Type G buildings shall be subdivided as required in Paragraph 5539 for Type E buildings. All open spaces at eaves shall be firestopped.

Towers and Steeples on Type G Buildings

Par. 5735. All parts of the towers and steeples on the roofs of Type G buildings shall be constructed as required for the building.

Penthouses on Roofs Over Type G Buildings

Par. 5736. All parts of penthouses on the roofs of Type G buildings shall be constructed as required for the building.

Other Structures on Roofs Over Type G Buildings

Par. 5738. Skylights, scuttles and similar structures on the roofs of Type G buildings may be of any construction permitted by this Code.

SECTION 574

FLOORS IN TYPE G, WOOD FRAME, BUILDINGS

Scope of Floors in Type G Buildings

Par. 5740. This Section includes the requirements for the construction of floors in Type G buildings.

Floor Framing in Type G Buildings

Par. 5741. The structural members supporting the floors in Type G buildings shall be as required in Paragraph 5711.

Floor Construction in Type G Buildings

Par. 5742. The floors in Type G buildings may be of any construction permitted in this Code.

Floors which are in contact with the soil shall be of concrete not less than 3 inches thick or of other masonry not less than 4 inches thick and shall be sealed tightly to the foundation walls.

Occupancy Separation Floors in Type G Buildings

Par. 5745. Floors serving as separations between occupancies in Type G buildings shall be of fire-resistive construction as required in Section 407.

SECTION 575

INTERIOR WALLS IN TYPE G, WOOD FRAME, BUILDINGS

Scope of Interior Walls in Type G Buildings

Par. 5750. This Section includes the requirements for walls enclosing passageways, all other interior walls, and the protection of openings therein in Type G Buildings.

Firestopping of Interior Walls in Type G Buildings

Par. 5751. All interior walls of wood frame construction in Type G buildings shall be firestopped at every floor and roof level. Such firestopping shall extend over the full length of the wall, and shall be constructed as required in Paragraph 5916.

Interior Fire Walls in Type G Buildings

Par. 5752. Interior fire walls in Type G buildings shall be constructed where required in Part IV and in accordance with Section 598.

Interior Bearing Walls in Type G Buildings

Par. 5753. Interior bearing walls in Type G buildings which are below the ground level shall be of not lower than two-hour fire-resistive construction.

Walls Enclosing Vertical Shafts in Type G Buildings

Par. 5754. Interior walls enclosing vertical shafts in Type G buildings shall be constructed as required in Section 576.

Walls Enclosing Passageways in Type G Buildings

Par. 5755. Interior walls enclosing passageways in required exits from a story of a Type G building occupied by more than one tenant shall be of one-hour fire-resistive construction.

The openings in such walls shall be protected by doors or windows of any construction permitted by this Code.

Tenancy Separation Walls in Type G Buildings

Par. 5756. Interior walls separating tenancies in Type G buildings shall be of one-hour fire-resistive construction.

Where such walls serve as occupancy separations they shall have a fire-resistive rating as required in Section 407.

Other Interior Walls in Type G Buildings

Par. 5757. Fixed and movable partitions in Type G buildings may be of any construction permitted by this Code.

SECTION 576

SHAFTWAYS IN TYPE G, WOOD FRAME, BUILDINGS

Scope of Shaftways in Type G Buildings

Par. 5760. This Section includes the requirements for the construction of enclosures for stairwells, interior elevator shafts, ventilation shafts, pipe shafts, light shafts, dumbwaiters and vertical openings in Type G buildings as are required in Part IV, and of the enclosure of exterior elevator shafts.

Interior Shaftways in Type G Buildings

Par. 5762. The enclosing walls of all interior shafts in Type G buildings shall be of not lower than one-hour fire-resistive construction, with the interior openings therein protected by one and three-eighths inch thick solid wood slab doors or by doors of equal fire-resistiveness.

Exterior Elevator Shafts in Type G Buildings

Par. 5768. All exterior passenger or freight elevator shafts attached to Type G buildings shall be enclosed by walls constructed as required for the exterior walls of the building.

SECTION 577

STAIRS IN TYPE G, WOOD FRAME, BUILDINGS

General Requirements for Stairs in Type G Buildings

Par. 5770. All parts of stairs, ramps, the finish on stairs, ceilings under the stairs, and their railings, in Type G buildings, shall be constructed as required in Section 567 for Type F buildings.

SECTION 578

PROTECTION OF EXTERIOR OPENINGS IN TYPE G, WOOD FRAME, BUILDINGS

Scope of Protection of Exterior Openings in Type G Buildings

Par. 5780. This Section includes the requirements for the doors and windows in exterior walls of Type G buildings.

For protection of openings near the ground, refer to Paragraph 7601.

Exterior Openings in Type G Buildings

Par. 5781. Exterior openings in Type G buildings shall be protected by substantial doors or windows.

SECTION 579

INTERIOR FINISH IN TYPE G, WOOD FRAME, BUILDINGS

General Requirements of Interior Finish in Type G Buildings

Par. 5791. All interior finish in Type G buildings shall be of non-flammable materials, except that in such buildings for Commercial, Storage or Industrial occupancy, all baseboards and wainscoting shall be of metal or other approved material of equivalent toughness.

CHAPTER 58

TYPE M—MIXED TYPES OF BUILDINGS

Sec. 580—General Requirements for Type M Buildings.
Sec. 582—Prohibited Mixed Types of Buildings.
Sec. 587—Equivalent of Dual Mixed Types of Buildings.
Sec. 588—Equivalent of Mulitple Mixed Types of Buildings.

SECTION 580

GENERAL REQUIREMENTS FOR TYPE M BUILDINGS

General Requirements for Mixed Types of Buildings

Par. 5800. Any building or other structure consisting of two or more different types shall be considered a Type M building.

Every building or other structure in which the different types are in proportions as hereinafter set forth shall be considered as the equivalent of a pure type of building and so designated by adding the letter indicating the pure type to the letter "M".

Buildings or structures in which a certain building type occurs as an isolated unit, such as a story, or a whole section of a building separated from the remaining sections by fire walls, shall not come under this classification, but shall be considered as an aggregate of different types of buildings.

Permitted Mixed Types of Buildings

Par. 5801. Mixed, Type M, buildings are permitted as substitutions for the pure types as required in Part IV if they have the equivalent classification of the pure types.

For example, Type M_B may be substituted for Type B, Fire-resistant.

Classification of Type M Buildings

Par. 5802. Type M buildings are divided into two sub-types, dual and multiple.

The dual mixed type consists of two different types only.

Multiple mixed type consists of three or more types.

Disputed Mixed Type Buildings

Par. 5809. In the event that any dispute should arise concerning the type of any building or other structure and the owner thereof does not agree with any decision which the Buildings Engineer may make relative thereto, the said owner may appeal from any said decision of the Buildings Engineer as provided in Section 194 of this Code.

SECTION 582

PROHIBITED MIXED TYPES OF BUILDINGS

Buildings Supported on Lower Construction Types

Par. 5820. A building or structure shall not be structurally supported by a lower type of building or construction; that is, columns, girders, trusses, or beams supporting columns shall not have a lower fire-resistive rating than that required for such members in the highest type of building or structure they support.

Type A Buildings Mixed with Lower Types

Par. 5821. Mixed types of buildings or structures erected hereafter or before the passage of this Code shall not be classified, accepted or certified as Type A, Fireproof, buildings.

SECTION 587

EQUIVALENT OF DUAL MIXED TYPES OF BUILDINGS

Method of Classifying Dual Mixed Types of Buildings

Par. 5870. To determine the equivalent mixed type of a building or other structure consisting of two construction types, first the percentage of the various construction types shall be estimated, and the mixed type determined from the following table:

TABLE 5870T

Equivalent Mixed Type	M_B		M_C		M_D		M_E		M_F		M_G
	% over	% under	% over	% under	% over	% under	% over	% under	% over	% under	All buildings containing G type and not satisfying the required percental relations of a higher mixed type
Percentage of various types in the building	80B	20C	55C	45D	80D	20E	80E	20F	67F	33G	
	82B	18D	82C	18E	92D	8F	90E	10G	50A	50G	
	95B	5E	95C	5F	97D	3G	58A	42G	54B	46G	
	96B	4F	97C	3G	60A	40E	62A	38G	60C	40G	
	64A	36C			68A	32F	60B	40F	60D	40G	
	66A	34D			70A	30G	68B	32G	64E	36G	
	76A	24E			64B	36E	66C	34F			
	79A	21F			70B	30F	74C	36G			
					75B	25G	70D	30F			
					78C	22E	80D	20G			
					90C	10F					
					92C	8G					

NOTE: All mixed dual types not satisfying the requirements of this table shall be determined by the lowest type occurring in the building.

Figures above the horizontal lines apply to existing buildings only.

SECTION 588

EQUIVALENT OF MULTIPLE MIXED TYPES OF BUILDINGS

Method of Classifying Multiple Mixed Types of Buildings

Par. 5880. To determine the equivalent mixed type of a building or other structure consisting of three or more types, first the percentage of the various types shall be estimated and then the mixed type determined as follows:

a. All types which occur to the extent of less than 12 per cent of the whole building shall be disregarded, but the total percentage of all disregarded types shall not exceed 18 per cent.

b. If only one type remains after such elimination, the remaining type shall determine the equivalent mixed type.

c. If two types remain, the equivalent mixed type shall be determined from the table in Paragraph 5870. Before consulting the table, the percentages of the remaining types shall be re-calculated, so as to sum up to one hundred, retaining at the same time the former percental relation.

d. If three or more types remain after the elimination, the lowest of the remaining types shall determine the equivalent mixed type.

CHAPTER 59

FIRE-RESISTIVE MATERIALS AND CONSTRUCTION

Sec. 590—General Regulations for Fire-Resistive Materials and Construction.
Sec. 591—Fire-Resistive Materials.
Sec. 592—Fireproofing of Columns.
Sec. 593—Fireproofing of Beams, Girders and Trusses.
Sec. 594—Fire-Resistive Floors and Roofs.
Sec. 595—Fire-Resistive Walls and Partitions.
Sec. 596—Fire Doors, Shutters and Windows.
Sec. 597—Fire-Resistive Roofing.
Sec. 598—Fire Walls.
Sec. 599—Other Fire Division Separations.

SECTION 590

GENERAL REGULATIONS FOR FIRE-RESISTIVE MATERIALS AND CONSTRUCTION

Scope of Fire-Resistive Materials and Construction

Par. 5900. Fire-resistive materials and construction shall include all materials, assemblies and combinations of materials which are to be used for fire protection of structural members, for constructing fire-resistive walls, floors, ceilings, partitions, doors, and windows, and all other parts of a building which require fire-resistive ratings and for the construction of fire-retardant and ordinary roofing.

Classification of Fire-Resistive Construction

Par. 5901. The fireproofing of structural members, and fire-resistive floors, roofs, walls and partitions, are classified in this Chapter according to the fire-resistive qualities as defined by this Code. They are divided into fire-resistive assemblies of construction of four-hour, three-hour, two-hour and one-hour rating.

Fire doors and shutters are divided in this Chapter into Classes "A", "B", "C" and "D", as defined in Section 596. Fire-resistive windows are not classified.

Roofings are divided in this Chapter into fire-retardant and ordinary roofings.

Rating of Fire-Resistance

Par. 5902. All materials, assemblies or combinations of such materials, and fireproofing rated for fire-resistiveness in this Chapter, shall be accepted where a construction or protection of such rating is required in this Code.

A fire-resistive construction or protection of a higher rating than that required shall also be accepted.

Certificates and Tests for Fire-Resistive Materials and Construction

Par. 5903. If materials, assemblies or combinations of materials which are not listed in this Chapter are intended for use in fire-resistive construction of a certain rating required by this Code, their fire-resistive rating shall be established as regulated in Section 168.

Thickness of Fireproofing Materials

Par. 5904. All thicknesses of fireproofing and fire-resistive materials indicated in this Chapter shall mean minimum thicknesses.

The thickness of the fireproofing on structural members shall be the net thickness of the fireproofing materials. Where metal lath is used in plaster for fireproofing on such members, the thickness shall be measured from the face of such plaster to the back of the metal lath.

Pipes and Conduits in Fireproofing

Par. 5905. Pipes, wires, conduits more than one and one-quarter inches in diameter, and ducts, shall not be embedded in or placed behind the fireproofing material required for structural or reinforcing steel, except if they have a covering of fire-resistive material at least as thick as that required for the structural or reinforcing steel.

SECTION 591

FIRE-RESISTIVE MATERIALS

Concrete, Concrete Blocks and Gunite for Fire-Resistive Construction

Par. 5910. Concrete to be used in fire-resistive construction shall have a breaking strength of not less than 1500 pounds per square inch.

Such concrete shall be classified for the purpose of this Chapter as follows:

Class 1 Concrete—a concrete made with a Class 1 coarse aggregate of calcareous gravel, blast furnace slag, cinders, burnt clay or shale.

Class 2 Concrete—a concrete made with a Class 2 coarse aggregate or siliceous gravel.

Concrete made with a course aggregate whose mineral composition is unknown, shall be considered as Class 2 Concrete.

For the classification of coarse aggregates, refer to Section 642.

Gunite and other pneumatically projected mortar made of Portland cement, sand containing less than 60 per cent silica and water, shall be rated for fire-resistiveness the same as Class 1 concrete. Such mortars made with sand containing 60 per cent or more silica shall be rated the same as Class 2 concrete.

Brick and Structural Clay Tile for Fire-Resistive Construction

Par. 5911. Hollow or solid brick to be used in fire-resistive construction shall be made of burned clay or shale, Class 1 Concrete, or sand and lime, and shall be not lower than Grade "C" quality, as specified in Paragraph 6110.

Structural clay tile shall meet the requirements of Section 617.

Hollow structural clay tile used for fire-resistive arched floor construction shall have shells at least five-eights of an inch thick and webs at least one-half inch thick. The maximum spacing of interior horizontal and vertical webs in such tiles shall be 4 inches and they shall have at least 2 cells in depth.

Natural and Cast Stone for Fire-Resistive Construction

Par. 5912. Natural stone, to be used in fire-resistive construction, shall be limestone, marble, slate or equally fire-resistive stone. Other less fire-resistive stones, such as granite or sandstone, shall not be used as fire protection for structural metal, but may be used in fire-resistive masonry walls not less than 12 inches thick.

Natural stone or cast stone masonry shall have the same fire-resistive rating as brick masonry of half the thickness of such stone masonry, except rubble stone masonry.

Gypsum Tile and Cast Gypsum for Fire-Resistive Construction

Par. 5913. Precast solid or hollow gypsum tile, or blocks, to be used in fire-resistive construction, shall not contain more than 3 per cent, by weight, of wood or other combustible binder or filler.

Cast-in-place gypsum shall not contain more than 12½ per cent, by weight, of wood or other combustible binder or filler.

Plaster for Fire-Resistive Construction

Par. 5914. All plaster called for in fire-resistive assemblies in this Chapter shall be Portland cement or gypsum plaster, unless otherwise noted.

Cement plaster used in fire-resistive construction shall contain one part of Portland cement and not more than 3 parts of sand by volume. Lime putty or hydrated lime may be added to such a mixture in quantities not exceeding 15 per cent by volume of the cement.

Sanded gypsum plaster shall contain one part of gypsum and not more than 3 parts of sand, by weight, unless otherwise required in this Chapter and except as required in Paragraph 7578 for ceilings. Neat gypsum plaster shall not contain more than twelve and one-half per cent, by weight, of combustible binder or filler.

Only gypsum plaster shall be used on gypsum masonry in fire-resistive construction.

Plaster used as fire-resistive material or as fireproofing shall be reinforced with expanded metal lath or wire mesh of a weight required in Paragraph 5915, except plaster less than one inch thick used on masonry, and except where perforated gypsum board is permitted in Paragraph 5954.

All materials, except sand, used in the plaster for fire-resistive construction shall also conform to the applicable requirements for mortar materials in Section 619.

Metal and Gypsum Lath for Fire-Resistive Construction

Par. 5915. Expanded metal lath or wire mesh used in plaster for fire-resistive construction shall weigh not less than 2.45 pounds per square yard. The wire mesh shall have not more than two and one-half meshes per inch.

Gypsum lath used as a base for gypsum plaster shall be at least three-eighths of an inch thick and shall have perforations, each with an area of not less than 0.44 square inch and totaling not less than two and three-quarter per cent of the area of the lath.

Firestopping Materials

Par. 5916. Firestopping, wherever required in this Code, shall be constructed as follows:

a. Wood not less than 4 inches thick, well fitted.

b. Sheet metal not less than No. 24 U. S. Standard Gauge with at least 2 inches of incombustible materials.

c. Masonry not less than 4 inches thick.

d. Metal lath constructed as a basket and filled with incombustible materials at least 3 inches deep.

e. Metal lath and three-quarter inch gypsum or Portland cement plaster.

f. The combination of the above materials.

Firestopping shall fill completely the open space in the wall, and shall be placed at every ceiling level and at the level of every floor finish. Firestopping shall fit tightly around pipes or the pipe shall be provided with sleeves.

SECTION 592

FIREPROOFING OF COLUMNS

General Requirements for Fireproofing of Columns

Par. 5920. Columns required to be fire-resistive shall be covered by fire-resistive materials, as required in this Chapter, on all sides so that no metal parts shall be left unprotected.

Where voids are formed in accessible re-entrant spaces behind the fireproofing of steel and cast-iron columns, such voids shall be filled as required in Paragraphs 5923 and 5924.

All masonry used to render columns fire-resistive shall be well bonded or anchored to the columns.

Wire Mesh in the Fireproofing of Steel Columns

Par. 5921. Concrete, poured gypsum, or gunite fireproofing for columns of steel and cast-iron shall be reinforced with metal wire mesh made of not less than No. 5 United States Standard Gauge wire spaced not over 8 inches apart, except Class 1 concrete fireproofing 2 inches or more in thickness. Such reinforcement shall be well embedded in the fireproofing.

Where wire mesh is required in the beds of clay tile or gypsum block masonry used for fireproofing of steel or cast-iron columns, such metal mesh may be replaced by iron and steel ties not less than 0.18 inch in diameter, placed in the joints, or by ties of equal cross-sectional area.

Protection of Fireproofing on Steel Columns

Par. 5922. The corners of the fireproofing on steel or cast iron columns shall be protected with metal or other suitable material against injury by moving vehicles or equipment.

Rating of Fireproofing on Steel Columns

Par. 5923. All materials and assemblies having at least the thicknesses shown in the following table, and used as fireproofing on structural steel columns, shall be assumed to have the fire-resistive rating indicated therein:

TABLE 5923T

Protecting Materials				Fire-resistive Rating				Remarks
				4 Hrs.	3 Hrs.	2 Hrs.	1 Hr.	
Concrete	Class I Concrete		Thickness	2	1¾	1½	1	See Paragraphs 5921 & 5926
			Fill	S	S	S	S	
	Class II Concrete		Thickness	3	2½	2	1½	
			Fill	S	S	S	S	
	Concrete Block Masonry		Thickness	4	3	3	2	To have wire mesh in beds. No fill required if blocks are solid.
			Fill	M	M	N	N	
			Plaster	½	½	½	–	
			Thickness	Two-2				
			Fill	M				
			Plaster	½				
	Cinder Concrete Block Masonry	Solid	Thickness	3	2	2		
			Fill	M	M	M		
			Plaster	½	½	–		
		Hollow	Thickness	4	3	2	2	
			Fill	M	M	M	–	
			Plaster	½	½	–	–	
Solid Brick Masonry			Thickness	3¾	3¾			
			Fill	M	N			
			Thickness	2	2	2	2	To have wire mesh in beds.
			Fill	M	M	M	N	
			Plaster	¾	½	–	–	
Structural Clay Tile Masonry			Thickness	4	4	4		Two 2" tiles may be used instead of one 4" tile.
			Fill	M	M	N		
			Plaster	½	–	–		
			Thickness	3	3	3		
			Fill	M	M	N		
			Plaster	⅝	½	½		
			Thickness	2	2	2	2	To have wire mesh in beds for 4 hr. rating only.
			Fill	M	M	M	N	
			Plaster	¾	⅝	–	–	
Gypsum	Gypsum Block Masonry	Solid	Thickness	2		2		To have wire mesh in beds for 2 hr. rating only. Gypsum plaster only shall be used.
			Fill	M		M		
			Plaster	½		–		
		Hollow	Thickness	4				
			Fill	M				
			Thickness	3	3			
			Fill	M	M			
			Plaster	½	–			
	Poured Gypsum		Thickness	2	1½	1		See Paragraph 5921
			Fill	S	S	S		
Metal lath or wire mesh and plaster			No. of layers	3	2	2	1	Each layer to have lath or mesh, ¾ inch air space to be left between layers See Paragraph 5915
			Thickness of each layer	1	1¼	⅞	1	
			Fill	M	M	N	N	

LEGEND:

S = Fill of the same material as that of the protection.
M = Masonry fill.
N = No fill required.

The thickness of material and plaster is given in inches.

The thickness of covering, for all ratings, on the outer edges of lugs or brackets need not be more than one inch.

Rating of Composite Columns and of Fireproofing on Cast-Iron Columns

Par. 5924. All materials and assemblies having at least the thicknesses shown in the following table, used as fireproofing on cast-iron columns, and composite columns shall be assumed to have the fire-resistive rating indicated therein:

TABLE 5924T

Protecting Materials			Fire-Resistive Rating				Remarks
			4-hrs.*	3-hrs.	2-hrs.	1-hr.	
Concrete	Class I Concrete	Thickness	2	1¾	1½	1	See Pars. 5921 and 5926
	Class II Concrete	Thickness	3	2½	2	1½	
	Concrete Block Masonry	Thickness	4	3	3	2	
		Plaster	½	½	..	..	
Structural Clay Tile Masonry		Thickness	3	2	2	2	
		Plaster	¾	¾	½	..	
Solid Gypsum Block Masonry		Thickness	3	3	2	1½	
		Plaster	⅝	½	½	½	
Metal Lath and Plaster		No. of layers	..	2	2	1	Airspace between column and plaster to be broken every 3 feet. See Par. 5915.
		Thickness	..	1½	1	1	
		Airspace	..	½	½	..	

Legend: Thickness of materials and plaster are given in inches.

* In existing buildings only.

Rating of Fireproofing on Reinforced Concrete Columns

Par. 5925. Concrete having at least the thickness shown in the following table, and covering the main reinforcement, spirals, and ties one-half inch or larger in diameter in reinforced concrete columns shall be assumed to have a fire-resistive rating as indicated therein:

TABLE 5925T

Composition of Concrete		Fire-Resistive Rating				Remarks
		4-hrs.	3-hrs.	2-hrs.	1-hr.	
Class I	Thickness of Covering in Inches	1½	1½	1	1	See Paragraph 5926
Class II		2	1¾	1½	1	

Substitution of Plaster for Concrete Fireproofing on Columns

Par. 5926. Where concrete is required in this Section for the protection of steel or reinforced concrete columns, an equal thickness of Portland cement or gypsum plaster up to a thickness of one-half inch, and an equal thickness of Portland cement or gypsum plaster reinforced with metal lath up to a thickness of one inch, may be substituted for such concrete protection. The metal lath used in this plaster shall be as required in Paragraph 5915.

SECTION 593

FIREPROOFING OF BEAMS, GIRDERS AND TRUSSES

General Requirements for Fireproofing of Steel Beams, Girders and Trusses

Par. 5930. Steel beams, girders and trusses, required to have fireproofing, shall be covered on all sides except where they are adequately protected by a floor, ceiling, or roof, constructed as indicated in Section 594, for the required rating.

Where voids are formed in accessible, re-entrant spaces behind the fireproofing of steel beams, girders and trusses, such voids shall be filled as required in Paragraph 5932.

Wire Mesh and Anchors in the Fireproofing of Steel Beams, Girders and Trusses

Par. 5931. Concrete, poured gypsum or gunite fireproofing on steel beams, girders and trusses shall be reinforced with metal wire mesh weighing not less than 1.5 pounds per square yard, with the wires spaced not over 6 inches, or made of at least No. 11 U. S. Standard Gauge wires spaced not over 4 inches. Such reinforcement shall be well embedded in the fireproofing.

Soffit tiles used for fireproofing of beam flanges shall be tied to the flange with metal ties.

All masonry used for fireproofing of structural steel beams. girders and trusses shall be mechanically anchored to the structural members.

Rating of Fireproofing on Steel Beams, Girders and Trusses

Par. 5932. All materials and assemblies having at least the thickness shown in the following table and used as fireproofing on structural steel beams, girders and trusses, shall be assumed to have the fire-resistive rating indicated therein:

TABLE 5932T

Protecting Materials				Fire-Resistive Rating				Remarks
				4-hrs.	3-hrs.	2-hrs.	1-hr.	
Concrete	Class I Concrete		Thickness	2	1¾	1½	1	See Pars. 5931 and 5935
			Fill	S	S	N	N	
	Class II Concrete		Thickness	3	2½	2	1½	
			Fill	S	S	N	N	
	Concrete Block Masonry		Thickness	3	2	..	2	No fill required if blocks are solid
			Fill	M	M	..	N	
			Plaster	½	½	..	..	
	Cinder Concrete Block Masonry	Solid	Thickness	3	3	2	2	
			Fill	M	M	N	N	
			Plaster	½	..	½	..	
		Hollow	Thickness	..	..	..	..	
			Fill	..	..	..	..	
			Plaster	..	..	..	..	
Solid Brick Masonry			Thickness	3¾	2	2	..	
			Fill	M	M	M	..	
			Plaster	..	½	..	..	
Structural Clay Tile Masonry			Thickness	3	2	..	2	
			Fill	M	M	..	N	
			Plaster	½	½	..	..	
Gypsum	Gypsum Block Masonry	Solid	Thickness	2	2	2	..	Gypsum plaster only shall be used
			Fill	M	M	N	..	
			Plaster	½	½	..	..	
		Hollow	Thickness	3	3	3	..	
			Fill	M	M	N	..	
			Plaster	½	½	..	..	
	Poured Gypsum		Thickness	2	1½	1	..	See Par. 5931. Gypsum Plaster only shall be used
			Fill	S	S	S	..	
			Plaster	½	½	..	..	
Metal Lath or wire mesh and plaster			No. of layers	..	..	1	1	See Par. 5915
			Thickness of each layer	..	..	1½	⅞	
			Fill	..	..	N	N	

Legend: S = Fill of the same material as that of the protection.
M = Masonry fill.
N = No fill required.
The thickness of material is given in inches.

Fireproofing of Reinforced Concrete Beams and Trusses

Par. 5933. The steel in reinforced concrete beams, girders, trusses and in the ribs of reinforced concrete floors or roofs, if one or both sides and the soffit of such ribs may be exposed to fire, shall be protected with at least such a thickness of concrete as indicated in Paragraph 5934, where a certain fire-resistive rating is required.

Where a reinforced concrete floor or roof has a flush ceiling, formed by permanent floor tiles between the ribs, the reinforcement shall have the protection as indicated in Paragraph 5942 for the required rating.

Rating of Fireproofing on Reinforced Concrete Beams and Trusses

Par. 5934. Concrete having at least the thickness shown in the following table, and covering the main reinforcement and stirrups one-half inch or larger in diameter in reinforced concrete beams, joists, girders and trusses, shall be assumed to have a fire-resistive rating as indicated therein:

TABLE 5934T

Composition of Concrete		Fire-Resistive Rating				Remarks
		4-hrs.	3-hrs.	2-hrs.	1-hr.	
Class I	Thickness of covering in inches	1½	1½	1	¾	See Paragraph 5935
Class II		2	1¾	1½	1	

Substitution of Plaster for Concrete Fireproofing on Beams, Girders and Trusses

Par. 5935. Where concrete is required in this Section for the protection of steel or reinforced concrete beams, girders and trusses, an equal thickness of Portland cement or gypsum plaster up to a thickness of one-half inch, and an equal thickness of Portland cement or gypsum plaster reinforced with metal lath up to a thickness of one inch, may be substituted for such concrete protection. The meal lath used in this plaster shall be as required in Paragraph 5915.

SECTION 594

FIRE-RESISTIVE FLOORS AND ROOFS

Fire-Resistive Floor and Roof Construction

Par. 5940. Floors and roofs required to have higher than one-hour fire-resistive rating shall be constructed of incombustible materials.

The thickness of granolithic finish, burned clay, or ceramic tile, or other similar incombustible floor finish, or two-thirds of the thickness of sand, cinder or other incombustible filling materials, may be included in the total thickness of the floor or roof construction materials required in Paragraph 5941. Wooden sleepers may be imbedded in such filling materials.

Beams, joists or purlins in floors or roofs and tie-rods shall have fireproofing of the same rating as that required for the floors or roofs they support, unless the floor or roof assembly, as described in Paragraph 5941, includes the structural members.

Where solid reinforced concrete or gypsum slabs are protected by a three-quarter inch thick ceiling made of Portland cement or gypsum plaster on expanded metal lath, the thickness of such slabs, as required in Paragraph 5941, may be reduced one-half inch, but no such concrete slabs shall be less than 2 inches thick.

Rating of Fire-Resistive Floors and Roofs

Par. 5941. Floors and roofs constructed of such materials and in such minimum thicknesses as indicated in the following table shall be assumed to have a fire-resistive rating as shown therein:

TABLE 5941T

Assembly of Materials			Fire-Resistive Rating				Remarks
			4-hrs.	3-hrs.	2-hrs.	1-hr.	
Reinforced Concrete Solid Slabs	Class I	Thickness of Slab	5½	4½	4	3	See Par. 5942. Gypsum concrete may be substituted for Class I concrete
	Class II	Thickness of Slab	6½	5½	4½	3½	
Concrete Joists	With Ceiling	Top Slab	..	2¾	2	..	Ceiling to be of plaster on metal lath; joist to be not more than 24c. to c. See Pars. 5934 and 5942
		Ceiling	..	1	¾	..	
	Without Ceiling	Top Slab	..	4½	3½	3	
Solid Brick Arch		Thickness	4	4	4	..	Fill shall be of Class I concrete. Thickness of fill shall be measured on top of segmental arch. Arch tile to have at least 2 cells
		Fill on top	4	3	L	..	
		Thickness without fill	8	..	..	..	
Floor Tile	Flat tile Arch	Thickness*	8	8	8	..	
		Fill on top	4	2	L	..	
		Plaster	¾	½	..	..	
	Segmental tile arch	Thickness	..	6	6	6	
		Fill on top	..	L	L	N	
		Plaster	..	¾	½	½	
	Reinforced Concrete floor with tile fillers	Top slab	3	2½	2	None	Filler tiles to be of gypsum, cinder concrete or burnt clay
		Filler tiles	6	4	4	6	
		Plaster	¾	½	½	½	
Steel Joists or Light Steel Construction	Top and bottom slabs of concrete or gypsum	Top slab	2	1½	1½	..	
		Bottom slab	2	2	1½	..	
		Plaster	¾	⅝	½	..	
	Top slab of concrete or gypsum and ceiling	Top slab	..	2½	2	..	Ceiling to be plaster on metal lath. See Par. 5915.
		Ceiling	..	..	..	..	
		Cement	..	1½	⅞	..	
		Neat gypsum	..	1	..	..	
		Sanded gypsum	..	..	¾	..	
Wood Joists	No. of layers of floor boards		..	..	..	2	Place insulating layer between floor boards—Ceiling to be plaster on metal lath. See Par. 5915
	Ceiling		..	..	..	¾	

Legend: Thicknesses are given in inches.
L = fill shall be level with crown of arch.
N = No fill required.

Rating of Fireproofing on Reinforced Concrete or Gypsum Roof and Floor Slabs

Par. 5942. The steel reinforcement in reinforced concrete or gypsum solid slabs, and in reinforced concrete floor or roof construction with hollow tile fillers forming a flush ceiling, and in concrete joist construction with the joists spaced not over 36 inches on centers and having a suspended metal lath and plaster ceiling not less than three-quarter inch thick shall have a covering of at least the thickness shown in the following table for the various fire-resistive ratings indicated therein:

TABLE 5942T

Composition of Concrete		Fire-Resistive Rating				Remarks
		4-hrs.	3-hrs.	2-hrs.	1-hr.	
Class I	Thickness of Covering in Inches	1	1	¾	¾	Use these thicknesses for gypsum
Class II		1¼	1	1	¾	

Fire-Resistive Ceiling Construction

Par. 5943. Fire-resistive ceilings used for the protection of floor or roof framing and all hangers and fastenings necessary for its support shall be entirely of incombustible materials.

The metal reinforcement in such ceilings shall be protected as required in Paragraph 5942 for the given rating, except in ceilings of one-hour rating.

Fire-resistive ceilings shall be constructed so as to afford the greatest fire protection.

Rating of Fire-Resistive Ceilings

Par. 5944. Ceilings not forming a part of roof or floor assemblies, constructed of such materials and in such minimum thicknesses as indicated in the following table, shall be assumed to have a fire-resistive rating as shown therein:

TABLE 5944T

Materials			Fire-Resistive Rating				Remarks
			4-hrs.	3-hrs.	2-hrs.	1-hr.	
Poured reinforced concrete	Class I	Thickness	3½	3	2½	..	
		Plaster	..	..	..	..	
	Class II	Thickness	4	3½	3	..	
		Plaster	..	..	..	..	
Precast reinforced concrete slabs	Class I	Thickness	3½	3	2½	..	Slabs to be tongued and grooved
		Plaster	..	..	..	..	
	Class II	Thickness	4	3½	3	..	
		Plaster	..	..	..	..	
	Class I	Thickness	3	2½	2	..	
		Plaster	½	½	½	..	
	Class II	Thickness	3½	3	2½	..	
		Plaster	½	½	½	..	
Poured reinforced gypsum		Thickness	3	2½	2	..	
		Plaster	..	..	..	..	
Precast reinforced gypsum slabs		Thickness	3	2½	2	..	Slabs to be tongued and grooved
		Plaster	..	..	..	..	
		Thickness	2½	2	1½	..	Only gypsum plaster shall be used
		Plaster	½	½	½	..	
Metal lath or wire mesh and plaster		Thickness	..	..	..	1	Portland cement or gypsum plaster shall be used. See Par. 5915

Legend: Thicknesses are given in inches.

Such ceilings shall be used as fire-resistive construction only where specifically required or permitted, and to resist fire from below.

Ceilings of three-hour and four-hour rating shall be self-supporting and shall have incombustible supports.

Rating of Fire-Resistive Walls

Par. 5954. Walls and partitions constructed of such materials and in such minimum thicknesses as indicated in the following table shall be assumed to have a fire-resistive rating as shown therein:

TABLE 5954T

Assembly of Materials			Fire-resistive Rating				Remarks
			4 Hr.	3 Hr.	2 Hr.	1 Hr.	
Reinforced Concrete	Class I	Thickness	6	5	4	3	Aggregate not over 3/4". For reinforcement see Par. 6569
	Class II	Thickness	8	7	6	5	
Plain Concrete	Class I	Thickness	7	6	5	4	
	Class II	Thickness	9	8	7	6	
Concrete Block	Hollow Concrete Block Masonry	Thickness	12	12			The shell of the 8 inch block shall be not less than 1 1/2 inches thick, & that of the 12 in. block 1 3/4 in. Unplastered solid conc. block masonry to have the same thickness as that of plain conc. for the same rating.
		No. of Cells	1	1			
		Plaster	1/2"-2S	–			
		Thickness	12	8	8		
		No. of Cells	2	1	1		
		Plaster	–	1/2"-2S			
		Thickness	8		4	3	
		No. of Cells	1		1	1	
		Plaster	3/4-2S		5/8-2S	1/2"-2S	
	Hollow Cinder Concrete Block Masonry	Thickness	8	6	6	3	Haydite or similar aggregate may be used instead of cinders.
		No. of Cells	1	1	1	1	
		Plaster	5/8"-2S	1/2"-2S	–	1/2"-2S	
Brick	Solid Brick Masonry	Thickness	8		4	4	
		Plaster	–		3/4"-1S		
	Hollow Brick Masonry	Thickness	12	8	8		If plaster is omitted add 2 inches to the thickness.
		Plaster	1/2"-2S	1/2"-2S			
	Hollow "Rolok Bak" Masonry	Thickness	8	8	8		If plaster is omitted add 4 inches to the thickness.
		Plaster	5/8"-1S	1/2"-1S			
Structural Clay Tile Masonry		Thickness	12	12	12 | 8		
		No. of Cells	2	2	2 | 3		
		Plaster	3/4 2S	1/2 2S	– | –		
		Thickness	12	8	8	8	
		No. of Cells	3	4	2	2	
		Plaster	1/2"-1S	1/2"-1S	1/2-2S	–	
		Thickness	8	6	4	4	
		No. of Cells	2	2	1	1	
		Plaster	5/8"-2S	1/2"-1S	3/4"-2S	3/4-1S	
Rubble Stone masonry		Thickness	18	16	14*	12*	*Where specifically permitted.
		Plaster	3/4-1S	3/4-1S	3/4-1S	3/4-1S	
Hollow Conc. Block or Structural Clay Tile with Brick Facing		Facing	4	4	4		
		Backing	8	4	4		
		Plaster	–	1/2"-1S	–		
Structural clay tile with Hollow Tile Facing		Facing	4	4	4	4	
		Backing	8	8	6	4	
		No of Cells	3	3	2	2	
		Plaster	1/2-1S				
Gypsum Block	Hollow Gypsum Block Masonry	Thickness	8	8	2		Gypsum Plaster only shall be used.
		No. of Cells	2	2	1		
		Plaster	1/2"-2S	–	5/8"-2S		
		Thickness	6	6	6		
		No. of Cells	1	1	1		
		Plaster	3/4"-2S	1/2"-1S	–		
		Thickness		4	3	3	
		No of Cells		1	1	1	
		Plaster		3/4"-2S	1/2"-2S	–	
	Solid Gypsum Block Masonry	Thickness				2	
		Plaster				1/2"-2S	
Metal Lath & Plaster	Hollow Wall with Metal Studs.	Total Thickness			4 1/2	3	Wood studs to be 16" or less o.c.- 1:2 gypsum plaster to be used except for hollow walls of 2-hr. rating use neat gypsum plaster.- Perforated gypsum lath may be used for all 1-hr. ratings. See Par. 5915
		Studs					
		Plaster on Lath			7/8"-2S	5/8"-2S	
	Hollow Wall with Wood Studs.	Total Thickness				5 1/2	
		Studs				2 x 4	
		Plaster on Lath				3/4"-2S	
	Solid Wall with Metal Studs.	Total Thickness		4	3	2	
		Studs					
		Metal Lath		2S	2S	1S	

LEGEND:

All thicknesses are given in inches.
1S = On one side.
2S = On two sides.
No. of Cells. = The number of cells in the thickness of the wall.

SECTION 595

FIRE-RESISTIVE WALLS AND PARTITIONS

General Regulations for Fire-Resistive Walls and Partitions

Par. 5950. All walls and partitions required to have a fire-resistive rating of two hours or more shall be constructed entirely of incombustible materials.

The steel reinforcement in reinforced concrete walls and partitions of a given fire-resistive rating shall have the same thickness of covering as that required for the reinforcement in Paragraph 5942 for the same rating.

The thicknesses of masonry given in Paragraph 5954 do not include the thickness of plaster.

Combustible Projections Into Fire-Resistive Masonry

Par. 5952. Where combustible floor or partition members project into solid masonry, the thickness required in Paragraph 5954 shall be the distance from the end of such member to the opposite face of the wall plus 2 inches, but not more than the thickness of the wall.

Where such combustible members project into masonry constructed of hollow units laid with their cells horizontally, the required thickness may be measured as in solid masonry.

Where such combustible members project into masonry constructed of hollow units laid with their cells vertically, the thickness of the wall for fire-resistiveness shall be measured from the end of such member to the opposite face of the wall.

Where such combustible members project into hollow masonry constructed of hollow or solid units and where the space between the members and 4 inches above and below the members is filled solid with incombustible material for the whole thickness of the wall, the required thickness may be measured as in solid masonry.

Combustible members shall not be permitted to pass through fire-resistive masonry.

Structural Members in Fire-Resistive Walls

Par. 5953. Structural members passing through required fire-resistive walls of three-hour or four-hour rating shall be protected for their full length with a covering of the same fire-resistive rating as that of the walls, if the failure of such members in fire will cause the collapse of the walls. The supporting members of such structural members shall be protected with a covering of the same fire-resistive rating.

SECTION 596

FIRE DOORS, SHUTTERS AND WINDOWS

Classification of Fire Doors

Par. 5960. All doors constructed as indicated in the following table, and as required in Paragraph 5961, shall be accepted as fire doors of the classification shown therein:

TABLE 5960T

Type and Construction of Door	Opening not to exceed		
	Sq. Ft. in Area	Feet in Height	Feet in Width
CLASS A FIRE DOORS:			
Hollow metal, swinging, double leaf	..	10	8
Hollow metal, swinging, single leaf	..	10	4
Sheet metal, sliding, single	120	12	12
Sheet metal, sliding, in pairs	120	12	12
Sheet metal, swinging, single leaf	..	12	6
Sheet metal, swinging, double leaf	..	12	10
Tin Clad, 3 ply wood core, sliding	120	12	12
Tin Clad, 3 ply wood core, swinging single leaf	..	12	6
Tin Clad, 3 ply wooden core, swinging double leaf	..	12	10
CLASS B FIRE DOORS:			
Steel plate	..	10	4
Hollow metal, sliding	..	8	8
Metal clad, paneled swinging, single leaf	..	8	4
Metal clad, paneled swinging, double leaf	..	8	8
Steel counterbalanced	..	10	8
Tin Clad, 2 ply wood core, counterbalanced	..	10	8
Tin Clad, 2 ply wood core, sliding single	80	10	10
Tin Clad, 2 ply wood core, swinging single leaf	..	10	6
Tin Clad, 2 ply wood core, swinging double leaf	80	10	10
Steel rolling and lift-up type	80	12	12
CLASS C and CLASS D FIRE DOORS:			
Same as Class B doors, except as required in Paragraph 5961	..	..	..

Class A fire doors may be used where Class B or Class C doors are required in this Code, and Class B doors may be used where Class C doors are required. Two Class B or two Class C doors installed on the opposite sides of the wall may be used where one Class A or Class B door is required.

A fire door properly bearing a label of the Underwriters' Laboratories, Inc., certifying that it is suitable for the protection of a Class A, Class B, Class C or Class D opening, shall be acceptable as a Class A, Class B, Class C or Class D door, respectively.

Construction of Fire Doors

Par. 5961. Solder shall not be used in the construction of any fire door, except for filling of joints. The sheet metal shall be fastened to the wood core by nails or screws, and shall be fastened to the metal frame with bolts, rivets or by welding.

Class A doors shall have no glass panels. If glass panels are used on Class B doors they shall have not more than 100 square inches of total exposed area, nor any dimension more than 12 inches. Glass panels on Class C doors shall have not more than 1,296 square inches of total exposed area. Glass panels on Class D doors shall have not more than 720 square inches of total exposed area, nor any dimension more than 54 inches. All glass used in Class B, C and D doors shall be wire glass, not less than ¼ inch thick, and shall have a bearing of at least ⅝ inch in grooves at least ¾ inch deep.

The design and construction of all fire doors shall meet with the approval of the Buildings Engineer.

Tin clad, three-ply and two-ply fire doors shall be constructed according to the "Standard for Tin-Clad Fire Doors and Shutters" of Underwriters' Laboratories, Inc., Edition, August 1935, or they shall bear a label of the Underwriters' Laboratories, Inc., certifying their proper construction.

Hollow metal fire doors shall have substantial stiles and rails of at least No. 18 U. S. Standard Gauge Steel, reinforced for the hardware. The panels shall be made of at least two No. 20 U. S. Standard Gauge steel sheets and filled with asbestos or similar insulating material.

Sheet metal fire doors shall be constructed of not less than No. 26 U. S. Standard Gauge corrugated metal fastened to both sides of a rigid steel frame of structural shapes, with the corrugation running vertically on one side and horizontally on the other side. The steel frame shall be covered on both sides with asbestos not less than 1/16 inch thick.

Sheet metal doors may also be constructed of not less than No. 26 U. S. Standard Gauge plain metal fastened to both sides of a steel frame of structural shapes, with one inch space between the sheets of the panels, which space shall be filled with asbestos. The steel frame shall be covered with at least ⅛ inch asbestos, or similar insulating material.

All sheet metal doors shall be bound on the edges with rolled or pressed steel shapes.

Steel rolling fire doors shall be constructed of steel interlocking slats, sliding in grooves, and the roller and mechanism shall be enclosed in heavy sheet metal.

Steel plate fire doors shall be constructed of not less than No. 12 U. S. Standard Gauge metal fastened to a rigid steel frame of structural shapes.

Metal clad, paneled fire doors shall have stiles and rails with a wood core of at least 1¾ inches thick, and with wooden panels of at least ¾ inch thick, set at least ¾ inch into the frame. The whole door shall be covered with not less than No. 26 U. S. Standard Gauge metal, with all joints lapped.

Hardware for Sliding Fire Doors

Par. 5962. Hardware for sliding fire doors shall be made of good quality malleable iron not less than one-fourth inch thick or of flat rolled structural steel not less than three-eighths inch; provided that tubular steel tracks made of at least one-eighth inch steel may be used. Sliding tracks shall be supported so that a wall fastening is directly opposite each door hanger when door is in a closed position. Hangers supporting doors shall be fastened to the door with not less than three one-half-inch bolts extending through the door. Latches for fire doors shall be not less than two and one-half inches by three-eighths inch and latch bars shall be not less than one and one-half inches by one-fourth inch.

Hardware for Swinging Fire Doors

Par. 5963. Hardware for swinging fire doors shall be made as follows:

Hinges: For doors not exceeding 8 feet in height, the hinges shall be of steel or bronze. If made of steel, they shall be either full or half surfaced, or butt hinges at least four and one-half inches by four and one-half inches and not less than one-eighth inch in thickness. If made of bronze, they shall be butt hinges at least four and one-half inches by four and one-half inches and not less than three-sixteenth inch in thickness. When bronze hinges are used, a steel stud and socket shall be provided at each hinge. The studs shall be attached to the rear jamb and shall engage a socket at least three-fourths inch deep in the rear edge of each door.

Locks: Doors shall be provided with a mortise or unit lock which has a latch bolt with a throw of not less than three-fourths inch.

When mounted in pairs, the normally standing door shall have a push bolt at the top and at the bottom which has a throw of not less than three-fourths inch.

Astragals: Swinging fire doors mounted in pairs shall be provided with at least one astragal attached to one door and overlapping the opposite door at least three-fourths inch. This requirement shall not apply when the doors meet on a mullion.

Door Frames for Fire Doors

Par. 5964. Door frames for fire doors shall be constructed substantially of structural steel shapes, of hollow metal reinforced with steel members, or of tin-clad wood. The metal used on the outside surfaces of door frames shall be at least of the same thickness as that used on the door stiles.

Door frames shall have at least the same fire-resistiveness as the fire doors which they are supporting.

Door frames shall be rigidly tied into the masonry by metal straps, anchors, or similar devices.

The design and construction of all door frames for fire doors shall meet with the approval of the Buildings Engineer. Door frames bearing the label of the Underwriters' Laboratories, Inc., certifying them for use with fire doors, shall be acceptable for such purpose.

No transoms shall be permitted in door frames for Class A and Class B fire doors. If used above Class C or Class D fire doors, they shall be of the fixed type. The glazing in such transoms shall be as required for glass panes in fire doors.

Fire doors shall be installed as required in Section 762.

Fire Shutters

Par. 5965. Where fire shutters are required in this Code, they shall be constructed as required for Class C doors in Paragraph 5960 and Paragraph 5961, except that no glazed panels shall be permitted in fire shutters. Any fire shutters having at least the same fire-resistiveness as Class C doors shall be acceptable as a fire shutter.

Construction of Fire-Resistive Windows

Par. 5966. The sashes and frames of fire-resistive windows shall be made of hollow metal, rolled or pressed steel fabricated by pressing, welding, riveting or crimping, without the use of solder. The movable sashes shall be of the same construction as the fixed sashes.

The frames or sashes of fire-resistive windows shall be so fastened into the walls that they may expand in case of fire without buckling.

The glazing of fire-resistive windows shall be of wire glass at least ¼ inch thick. The glass shall be so set as to have a bearing of at least ⅜ inch in at least ½ inch deep continuous grooves, fastened by continuous glazing angles or moldings bolted to the sash.

All fire-resistive windows shall be of a construction which will meet with the approval of the Buildings Engineer.

Fire-resistive windows with fixed sashes of hollow metal construction shall not exceed 10 feet in height nor 7 feet in width. Such windows with movable sashes of hollow metal construction shall not exceed 10 feet in height nor 6 feet in width.

Fire-resistive windows with a sash of solid metal construction shall not exceed 84 square feet in area, nor 12 feet in any one dimension.

Glass panes in fire-resistive windows shall not exceed 720 square inches in area.

Fire-Resistive Windows of Glass Blocks

Par. 5967. Windows constructed of glass blocks which will pass a fire test for a rating of at least 45 minutes, conducted by a laboratory required in Paragraph 1681, shall be accepted as fire-resistive windows.

Fire-resistive windows of glass blocks shall be not over 84 square feet in area.

All details of construction of such windows shall be the same as those of the test window.

SECTION 597

FIRE-RESISTIVE ROOFING

Fire-Resistive Roofing Materials

Par. 5970. "Roofing felt" or "Asbestos roofing felt" shall mean, in this Code, a felt saturated with a bituminous compound.

"Roll roofing" shall mean, in this Code, a felt saturated with a bituminous compound, coated on both sides with a bituminous coating and surfaced on both sides with a suitable powdered mineral matter.

"Felt membrane" or "Asbestos felt membrane" shall mean, in this Code, a felt saturated with a bituminous compound and coated on one or both sides with a bituminous coating.

Asbestos felt used in required roof coverings shall contain not less than 85 per cent by weight of asbestos fibers.

Bituminous saturants and coatings used in fire-resistive roofing shall have a flash point of not less than 300 degrees F. as determined by the Cleveland open-cup method.

Roll roofing, roofing felt and felt membranes used in fire-resistive roof coverings shall be free from visible defects, such as holes, breaks, cracks, deeply ribbed surfaces and sagged or untrue edges.

Where roofing material is designated in this Code by weight this shall mean the weight per 108 square feet of the material as delivered by the manufacturer, unless otherwise noted.

Burned clay tile used as fire-resistive roofing shall satisfy the following breaking test and conditions:

> The tiles shall be supported at four points, which are located symmetrically about their center lines on their turned down edges in a manner that at least two such points on one side are 12 inches apart, and loaded concentrically at their center. Unless the average breaking load of five tiles selected at random is at least 400 pounds, and the breaking load for any tile tested is not less than 350 pounds, the tiles shall not be acceptable.

Classification of Fire-Resistive Roofing

Par. 5971. All fire-resistive roofing shall be classified for the purpose of this Code as fire-retardant or as ordinary roofing, as indicated in Paragraphs 5972, and 5973 and shall be used on such buildings where they are required elsewhere in this Code.

Fire-retardant roofing may be used where ordinary roofing is required, or where no roofing is mentioned.

Fire-Retardant Roofing

Par. 5972. All roofing materials and combinations of such materials which meet the requirements of the Underwriters' Laboratories, Incorporated, for Class A and Class B roofing shall be acceptable as fire-retardant roofing.

Built-up roofings shown in the following table shall also be accepted as fire-retardant roofing.

TABLE 5972T

Roofing Material	Roofing Felt				Felt Membrane	Asbestos Roofing Felt		Asbestos Felt Membrane	Total Number of layers	Remarks
Weight of Roofing in Pounds	14	26	30	40	20	14	40	18		
Number of layers of different materials in one combination			2						2	All combinations shall have a top layer of a bituminous compound completely covered with crushed rock, brick, gravel or other approved mineral surfacing material, except where the top layer consists of asbestos roofing felt or asbestos felt membrane, the additional mineral and bituminous surfacing material may be omitted. Such top layers may be substituted for required layers of equal or less weight and equal composition.
							2		2	
	4								4	
	2		1						3	
						2	1		3	
	2						1		3	
			1			2			3	
								3	3	
					3				3	
	2	1							3	
		1				2			3	
		1						2	3	
		1			2				3	

The following roofing materials, if used in such sizes and quantities as required below, shall also be accepted as fire-retardant roofings:

1. Asbestos cement shingles, at least one-eighth inch thick laid over a layer of 14-pound asbestos roofing felt.

2. Asbestos cement rigid sheets at least seven thirty-seconds inch thick.

3. Metal roof covering, corrugated or plain, of not less than No. 26 United States Standard gauge.

4. Natural slate shingles.

5. Burned clay roof tile.

6. Sheet metal shingles, made of No. 26 United States Standard gauge metal.

All roofing materials, combinations or built-up roofing in which the required materials are of a greater thickness or weight than indicated above, or are built up of more layers than required, shall also be accepted as fire-retardant roofing.

All fire-retardant roofing shall be laid and constructed as required in Paragraph 5974.

Ordinary Roofing

Par. 5973. All roofing materials and combinations of such materials which meet the requirements of the Underwriters' Laboratories, Incorporated, for Class C roofing shall be acceptable as ordinary roofing.

Built-up roofing shown in the following table shall also be accepted as ordinary roofing:

TABLE 5973T

Roofing Material	Roll Roofing		Roofing Felt			Felt Membrane	Asbestos Roofing Felt	Abestos Felt Membrane	Asphalt Saturated Shingles	Total number of layers	Remarks
Weight of Roofing in Pounds	30	40	14	15	26	20	14	18			
Number of layers of different materials in one combination									1	1	
		1								1	
	1		1							2	
	1						1			2	
							2			2	
								2		2	
			1		1					2	
					1			1		2	
				2						2	Top layer as required in Par. 5972, or shall consist of 80 pound roll roofing or any mineral surfaced roofing bearing the Class C label of the Underwriters Laboratories.
						2				2	

All ordinary roofing shall be constructed and laid as required in Paragraph 5974.

Construction of Fire-Resistive Roofing

Par. 5974. The layers of built-up fire-retardant or ordinary roofing shall be laid in a bituminous compound of sufficient thickness so that no layer shall touch an uncoated layer.

Prepared roofing, composition shingles, and other similar roofing shall be securely nailed to the sheathing or nailing strips, except when the roofing is secured by a bituminous compound to the sheathing. Such roofing weighing more than

14 pounds per square foot may be laid without any fastening on flat roofs.

Each slate shingle or burned clay tile without lugs shall be nailed or wired, or both, to the sheathing, nailing strips, or nailing compound. The nails shall be of such length as to provide a three-quarter inch penetration. The wire used shall be at least of No. 14 U. S. Standard Gage. All nails and wire used for fastening shingles or tiles shall be of a non-corroding metal or non-corroding alloy, except that nails used on roofs with a pitch of less than 8 inches to the foot may be of galvanized iron.

Sheet metal fire-resistive roofing shall be laid with locked joints on solid sheathing, except that corrugated, or formed sheet metal, may be laid without sheathing, with lapped joints.

Wooden Shingles

Par. 5975. Wooden shingles, where permitted, shall be of vertical grain or edge grain wood. They shall be of No. 1 Grade as specified by the "Federal Specifications CS 31-38". The combined thickness of five shingles, measured at the butts, shall be not less than 2 inches.

The exposure of such shingles to the weather on roofs shall not exceed 5 inches for 16 inch shingles, 5½ inches for 18 inch shingles and 7 inches for 24 inch shingles.

Wooden shingles shall not be permitted on roofs forming an angle less than 45 degrees with the horizontal.

Each shingle shall be firmly nailed to a closely fitted roof deck with nails protected against corrosion.

SECTION 598

FIRE WALLS

Scope of Fire Walls

Par. 5980. Fire walls shall include all party walls, all walls required to subdivide a building into fire divisions and all other walls which are required to be fire walls by this Code.

Construction of Fire Walls

Par. 5981. Fire walls may be bearing or non-bearing walls and shall be constructed of solid brick masonry not less than 8 inches thick, laid in Portland cement mortar, or of reinforced or plain solid concrete, having a four-hour fire-resistive rating, except that party walls of small dwellings not over 2 stories or 30 feet in height may be constructed of any masonry with a fire-resistive rating of not less than four hours.

Fire walls may be supported walls if the supporting frame is protected by a covering with a fire-resistive rating of not less than four hours. Otherwise, such walls shall be self-supporting and extend from the foundation to the roof.

All fire walls shall be continuous or they shall be fire-stopped, at intervening floor construction, with solid masonry of not less than four-hour fire-resistive rating. They shall extend to the underside of the roof slab and form an effective fire seal therewith in Type A, Fireproof, and Type B, Fire-resistant, buildings and at least 30 inches above the roof in other types of buildings, except as may be otherwise specifically permitted by the provisions of Paragraph 5527.

Openings in Fire Walls

Par. 5982. Openings in fire walls shall be permitted only where the areas on each side of such walls are occupied by the same tenant, or as permitted in Paragraph 2721.

Such openings shall not exceed 100 square feet in area nor shall more than one be placed at each floor level in each 100-foot length of wall or in a wall whose total length is less than 100 feet. Remainder lengths may have openings whose areas do not exceed 10 per cent of the area of such sections. Every opening in required fire walls shall be protected on each side of the wall with a Class A fire door.

Existing Openings in Fire Walls

Par. 5983. Existing openings in fire walls separating different tenants shall be ordered closed with masonry by the Buildings Engineer in his own discretion or at the request of either tenant. The masonry used to close such openings shall be of the same kind as is required in Paragraph 5981.

Combustible Projections Into Fire Walls

Par. 5984. The thickness of a fire wall behind wooden joists, beams, floors or partitions or other combustible members which project into such wall shall be at least 4 inches. Combustible members projecting into opposite faces of a fire wall shall have at least 4 inches of masonry or reinforced concrete between them.

Combustible structural members shall not be permitted to pass through fire walls.

Structural Members in Fire Walls

Par. 5985. Structural members passing through fire walls shall be protected as required in Paragraph 5953 for four-hour walls.

SECTION 599

OTHER FIRE DIVISION SEPARATIONS

Scope of Fire Division Separations

Par. 5990. Fire division separations shall include floors and other construction which are required for the separation of two adjacent fire divisions.

Fire Division Separation Floors

Par. 5992. Fire division separation floors shall be of reinforced concrete at least 6 inches thick or of solid masonry arches not less than 8 inches thick. The framing, all structural members, and walls supporting such floors shall be of not lower than four-hour fire-resistive construction.

Fire division separation floors shall be continuous without openings, between the exterior walls of the building or between fire walls.

PART VI

STRUCTURAL REGULATIONS

Chap. 60—General Structural Regulations.

Chap. 61—Masonry Materials.

Chap. 62—Wood Construction.

Chap. 63—Metal Construction.

Chap. 64—Concrete Materials.

Chap. 65—Design of Reinforced Concrete Construction.

Chap. 66—Proportioning, Mixing and Placing Concrete.

Chap. 67—Reinforced Gypsum Construction.

Chap. 68—Composite Construction.

Chap. 69—Indeterminate Structures.

CHAPTER 60

GENERAL STRUCTURAL REGULATIONS

Sec. 600—Structural Design Requirements.

Sec. 601—Dead Load.

Sec. 602—Weights of Building Materials.

Sec. 603—Live Loads.

Sec. 604—Impact.

Sec. 605—Lateral Forces.

Sec. 606—Load Tests.

SECTION 600

STRUCTURAL DESIGN REQUIREMENTS

General Design Requirements

Par. 6000. All buildings and other structures and parts thereof shall be designed by a method admitting of rational analysis according to established principles of mechanics. They shall safely support the dead loads, live loads and impact as hereinafter required, and shall, in addition be adequately braced against all lateral forces to which they may be subject.

Computation of Stresses

Par. 6001. Dead load, live load, impact and lateral forces, including wind, shall be treated separately for each member of the structure. Members shall be proportioned for that combination of loads and forces which will give the maximum total stress.

The allowable stresses, except for bolts, welds and timber connectors, may be increased 33 1/3 per cent for steel and concrete members, and 50 per cent for wood members, except wooden columns, for which see Section 624, when the wind stresses act alone or are combined with all other stresses; but in no case shall the maximum stresses for the combination of all the loads and forces other than wind exceed the allowable stresses.

Design Drawings and Specifications

Par. 6002. Design drawings and specifications for all buildings, structures or parts thereof, shall be furnished in accordance with the requirements of Chapter 13.

Deflection of Structural Members

Par. 6003. The deflection of beams, girders and trusses, except of those supporting elevator machinery, shall not exceed the following values:

TABLE 6003T

Load	Fraction of Span
Vibrating Machinery......................	$\frac{1}{1200}$
Free-standing Chimneys..................	$\frac{1}{1000}$
Crane Girders..........................	$\frac{1}{500}$
Plastered Ceilings (Live load only of floor or roof above)................	$\frac{1}{360}$
Masonry................................	$\frac{1}{240}$
Other Loads............................	$\frac{1}{120}$

For deflection of such members supporting elevator machinery, see Paragraph 9115.

Torque in Structural Members

Par. 6004. All beams, girders and other structural members shall be designed to resist the torque produced by the unbalanced moments or loads acting upon them.

Reinforcement for Existing Structures

Par. 6005. All structural members shall be relieved of as much stress as possible before any reinforcement is added. Due consideration shall be given to any stress existing or which may be caused in the structure at the time reinforcement is added.

When adding reinforcement to an existing structure subject to direct stress, the allowable fiber stress shall be computed from the formula:

$$f_r = (f_a - f_o)\frac{E_r}{E_o}$$

in which:

E_o—modulus of elasticity of the existing material
E_r—modulus of elasticity of the material used as reinforcement
f_a—allowable stress for the existing material
f_o—stress in the existing material
f_r—allowable stress for the reinforcing material

Required Services of Registered Professional Engineers

Par. 6006. The design of the following engineering work and the supervision of its construction shall be done by, or under the responsible charge of, a registered professional engineer who shall affix his signature and official seal to all drawings, specifications and other required documents:

All brick masonry in which the working stress in pounds per square inch exceeds 200, and all concrete block, tile, or rubble stone masonry in which such stress exceeds 100.

All timber construction in which the unit stresses exceed those given in Chapter 62 for the lowest structural grades in any species.

All metal construction in which the unit stresses exceed 90 per cent of those permitted in Chapter 63.

All controlled concrete construction.

All reinforced brick masonry.

All composite construction.

All indeterminate structures.

All pile foundations where the load per pile exceeds 15 tons for timber piles and 30 tons for other piles.

or such engineering work may be either designed by, or constructed under the personal supervision of, the owner of any proposed building or other structure in or about which the said engineering work is to be done or performed, or the said owner may do both, if there is attached to all drawings, specifications and other required documents, an affidavit made by the said owner containing the following applicable statements:

1. The said owner personally designed such engineering work;
2. That to the best of the knowledge and belief of the said owner, the proposed building or other structure in or about which the said engineering work is to be done or performed, if built in accordance with the design of said work, will fully comply with all of the requirements of this Code and will not be in conflict with any provisions of the Charter or Ordinances of the Mayor and City Council of Baltimore, except as specifically noted otherwise, and
3. The said owner will personally supervise the construction of such engineering work.

SECTION 601

DEAD LOAD

Definition of Dead Loads

Par. 6010. The dead loads of a building or other structure include the weights of the walls, fixed partitions, floors, roofs, framing and all other permanent stationary construction entering into and becoming a part of the building or structure.

Computation of Dead Loads

Par. 6011. In the computation of the dead loads for buildings and other structures, the actual weights of building material shall be used. The materials listed in Section 602 shall be assumed to weigh not less than that indicated.

Arch Action of Partitions

Par. 6012. The arch action of partitions shall not be assumed to relieve the supporting member, nor shall a partition be considered as bracing in any respect.

Partition Loads

Par. 6013. A uniformly distributed load of not less than 20 pounds per square foot shall be added to the dead loads of floors in such buildings where partitions, other than light wood or metal partitions, are not definitely located in the design, and in other structures subject to shifting of partitions without reference to arrangement of floor beams or girders. In all cases, the additional dead load provided for shall be stated on the plans filed with the Buildings Engineer.

SECTION 602

WEIGHTS OF BUILDING MATERIALS

Weights of Materials

Par. 6020. In designing buildings and other structures, the weight of building materials, used in the computation of loads, shall be assumed at not less than the following:

	Lbs. per cu. ft.
Aluminum	170
Brick Masonry	
Pressed or paving brick	150
Hard common brick	120
Cored brick	100
Chimney Block (hollow, radial) Masonry	120
Cinders	
Dry cinders in bulk	45
Cinder fill	54
Concrete	
Cinder concrete, fill	96
Cinder concrete, slabs and fireproofing	108
Stone or gravel concrete, plain	144
Stone or gravel concrete, reinforced	150
Slag concrete	120

Concrete Blocks	Lbs. per sq. ft.
8 in. hollow cinder concrete	40
12 in. hollow cinder concrete	60
8 in. hollow stone or gravel concrete	70
12 in. hollow stone or gravel concrete	105

	Lbs. per cu. ft.
Cork	15
Earth	
Common earth dry and packed	100
Wet mud	120
Gypsum	
Gypsum slabs, poured in place:	
Wet	100
Dry	75

Gypsum Masonry	Lbs. per sq. ft.
Solid tile, 2 in. thick	7
Solid tile 3 in. thick	12
Hollow tile 3 in. thick	10
Hollow tile 4 in. thick	12
Hollow tile 6 in. thick	16
Plaster	
1 in. thick, direct on masonry	5
1 in. thick, on wood or metal lath	8
1 in. thick, on suspended ceilings	10
Roofing	
Asbestos shingles	4
Asphalt shingles	6
Composition roofing	5
Gravel or slag on composition roofing	8
Tile	actual weight
Slate, one-quarter inch thick	10
Tin, copper	1
Corrugated iron	3
Skylights, including glass	10
Steel deck	actual weight

Stone Masonry	Lbs. per cu. ft.
Granite	175
Limestone	170
Marble	175
Sandstone	160
Rubble stone	160
Steel and Iron	
Structural steel	490
Cast iron	450

	Lbs. per sq. ft.
Structural Clay Partition Tile Masonry	
2 inch	13
3 inch	16
4 inch	18
6 inch	25
8 inch	30
10 inch	38
12 inch	45
Structural Clay Load-Bearing Tile Masonry	
8 inch	36
10 inch	42
12 inch	52
	Lbs. per cu. ft.
Architectural terra cotta	110
Water	62.5
	Lbs. per sq. ft.
Windows	
Wood frames, including glass	5
Steel frames, including glass	8
	Lbs. per cu. ft.
Wood	
Hard woods	48
Soft woods	36

Weights of Composite Construction

Par. 6021. The actual weights of the materials entering into composite construction shall be used in computing the dead load of such construction.

Acceptable Weights

Par. 6022. The Buildings Engineer may issue schedules showing acceptable weights of units of construction any may require these weights to be used in the absence of specific data justifying other assumptions.

SECTION 603

LIVE LOADS

Definition of Live Loads

Par. 6030. The live loads include the weights, other than dead loads, to be supported by the floors, roofs, walls, framing and other parts of a building or other structure. Live loads may be static, moving, transient or constant.

Live Loads on Floors

Par. 6031. The live loads assumed on floors for purposes of design shall be the greatest loads that will probably be produced by the intended occupancies. The following distributed live loads shall be taken as the minimum for the occupancies named:

	Lbs. per sq. ft.
Class I—Public Assembly	
Auditoriums:	
With floors sloping ¼″ per foot or more	75
With other floors	100
Dance and drill halls exceeding 2000 sq. ft. in area	125
Stage floors	125
Gridirons and fly galleries	75
Other public spaces where crowds of people are likely to assemble, such as skating rinks, cabarets, barrooms, etc.	100
Lobbies and corridors	100
Class II—Private Assembly	
Rooms 2000 sq. ft. or less in area	50
Rooms more than 2000 sq. ft. in area:	
With floor sloping ¼″ to one foot or more	75
With other floors	100
Corridors and lobbies	75
Gymnasiums	100
Class III—Dwellings	
Public dining rooms and other public rooms exceeding 2000 sq. ft. in area in all dwellings	100
Kitchens serving public dining rooms	60
In dwellings with not more than 4 apartments or 15 occupants, all parts, including stairways	40
In other dwellings:	
Public corridors, lobbies and stairways	75
All other parts	40
Class IV—Institutional	
Private rooms and wards	40
Dining rooms more than 2000 sq. ft. in area	100
Lobbies and other public rooms	90
Public corridors and stairways	75
Private corridors and stairways	40
Kitchens	60
Class V—Office*	
Offices, including corridors:	
First floor and basements	100
Above first floor	50

Class VI—Commercial	
Retail stores and service shops:	
First floor and basement	100
Above first floor	75
Restaurants and cafes	100
Wholesale stores and similar occupancies	See footnote
Class VII—Storage	
Garages:*	
Class A—For vehicles not exceeding 6000 pounds in weight, including load	60
Class B — For vehicles not exceeding 20,000 pounds in weight, including load	150
Class C—For vehicles exceeding 20,000 pounds in weight, including load	250
Other storage buildings	See footnote
Class VIII—Industrial	See footnote
Class IX—Special Structures	
Libraries:	
Reading rooms	60
Corridors and lobbies	100
Stack rooms	Actual load
Museums	100
Stables	75
Miscellaneous: (To be used in all buildings unless otherwise specified)	
Balconies, exterior	100
Cornices	75
Locker and shower rooms	75
Marquees	60
Rest rooms	50
Sidewalks*	200
Starways	100
Trucking spaces and driveways*	250

Footnote: When the live loads are known, such loads shall be used, but never less than 100 pounds per square foot. When the loads are unknown or when the buildings are intended for general use, the assumed live load shall be never less than 250 pounds per square foot.

*For special concentrations, see Paragraph 6033.

Partial Loading

Par. 6032. Consideration shall be given to the effects of partial as well as full live loading.

Concentrated Loads

Par. 6033. In the design of floors, consideration shall be given to the effects of known or probable concentrations of load to which they may be subjected; and in buildings designed for the occupancies listed herein, floors shall be made capable of supporting the prescribed distributed loads or the following minimum concentrated loads, whichever may result in the greater stresses. The concentrated loads indicated shall be so placed as to produce the maximum stresses in the member affected:

1. For office floors, including corridors, a load of 2000 pounds, assumed to occupy a space two and one-half feet square.
2. For garage floors subject to Class A loading, a concentrated load of 2000 pounds; to Class B loading, 10,000 pounds; and to Class C loading, 20,000 pounds.
3. For sidewalks, a concentrated load of 8,000 pounds.
4. For trucking spaces and driveways, a concentrated load of 20,000 pounds.
5. For structural supports of ceilings under accessible spaces, for trap doors and skylights, a concentrated load of 200 pounds.

Live Loads on Roofs

Par. 6034. The live loads, in pounds per square foot of horizontal projection, shown in the following table, shall be assumed as a minimum for the design of roofs:

Slope, per foot, of roof	Live Load
4 inches, or less	30
Greater than 4 inches, with a maximum of 12 inches	20
Greater than 12 inches	0

When a roof, in addition to serving as an enclosure of a building, is to be used as a floor, it shall be designed to support the live load to be imposed, which load shall not be less than that prescribed in Paragraph 6031 for the intended occupancy.

Reduction in Live Loads on Floors

Par. 6035. The assumed uniform live loads on floors in Public Asembly and Private Assembly buildings, Dwellings, Institutions and Office Buildings may be reduced on the entire contributing floor area by not more than the following percentages:

(a) For beams, girders and trusses supporting more than 300 square feet of tributary floor area .... 15 per cent

(b) For columns, piers, walls and foundations:

Supporting 1 floor	15 per cent
Supporting 2 floors	20 per cent
Supporting 3 floors	25 per cent
Supporting 4 floors	30 per cent
Supporting 5 floors	35 per cent
Supporting 6 floors	40 per cent
Supporting 7 floors	45 per cent
Supporting 8 floors or more	50 per cent

For girders and trusses supporting columns, the assumed uniform live load on the entire tributary floor area may be reduced not more than that permitted for the column supporting the largest number of floors.

No Reduction in Live Loads

Par. 6036. There shall be no reduction of live loads from roofs, of the concentrated loads specified in Paragraph 6033, of the live loads when used for the design of slabs or arches of floors, nor of the live loads affecting other structural members supporting less than 300 square feet of floor.

In Commercial, Storage and Industrial buildings, no reductions of any live load shall be permitted.

SECTION 604

IMPACT

Scope of Impact

Par. 6040. Impact includes the dynamic and vibratory effects of moving loads expressed as a percentage of such loads.

Impact Allowances

Par. 6041. The live loads prescribed herein shall be assumed to include a sufficient allowance to provide for the effects of ordinary impact. However, for special occupancies and loadings producing unusual impacts and vibrations, the synchronized frequency, magnitude and speed of such impacts and vibrations shall be considered in conjunction with the importance of the building or structure and with regard to their relation with human occupancy.

Impact of Traveling Cranes

Par. 6042. The wheel loads of traveling cranes shall be increased by at least the following percentage to provide for their impact effect:

Power driven cranes	25 per cent
Hand power cranes	10 per cent

Wheel load shall be the maximum load per wheel given by the manufacturer.

Impact of Amusement Devices

Par. 6043. The moving loads of roller coasters and other similar amusement devices shall be increased by at least 200 per cent to provide for their impact effect.

Impact of Other Rolling Loads

Par. 6044. Other rolling loads, except motor vehicles, shall be increased to provide for their impact effect by an amount to be determined for each specific type of loading to the satisfaction of the Buildings Engineer.

Impact of Elevators

Par. 6045. The moving dead and live loads of elevators shall be increased by at least the following percentages to provide for their impact effect:

Supporting Member	Impact
Beams (not including machine beams)	100 per cent
Columns	80 per cent
Foundations	40 per cent

Impact of Machinery

Par. 6046. The weight of machinery with heavy impacts or unusual vibrations shall be increased to provide for their impact effect by an amount satisfactory to the Buildings Engineer.

Impact for Timber Structures

Par. 6047. Impact on timber structures, not exceeding 100 per cent of the live load assumed for the structure, may be neglected.

SECTION 605

LATERAL FORCES

Scope of Lateral Forces

Par. 6050. The lateral forces on a building or other structure include the pressures and vacua produced by wind, hydrostatic and earth pressures, and other special forces.

Wind Pressures

Par. 6051. All buildings shall be made capable of resisting horizontal wind pressures on their exposed vertical surfaces, and normal wind pressures on their sloping roofs, without exceeding the stresses allowed in this Code.

The wind pressure on vertical plane surfaces shall be taken at 20 pounds per square foot for those portions not more than 500 feet above the ground and increased 2 pounds for each one hundred feet or fraction thereof, above 500 feet, except that the wind pressure on towers, tanks, signs, chimneys, stacks, and similar exposed structures and their exposed frames, shall be taken at not less than 30 pounds per square foot of net exposed area.

For cylindrical and octagonal surfaces, the area exposed to wind shall be assumed as two-thirds and five-sixths, respectively, of the projected area.

The normal wind pressure on a roof shall be computed as follows:

$$Pn = P\frac{\varnothing}{45}$$

but not to exceed the value when $\varnothing = 45°$

In which:

Pn—normal wind pressure

P —wind pressure on a vertical plane surface

$\varnothing$ —the angle the roof makes with the horizontal.

Wind Vacua

Par. 6052. All buildings or other structures with structural framing and roofs of all buildings, shall be designed to resist an outward pressure due to wind vacuum on the leeward side. This outward pressure shall be taken normal to the roof and wall surfaces and shall be assumed as not less than 15 pounds per square foot.

Wind Overturning

Par. 6053. The overturning moment due to wind pressures and vacua shall not exceed two-thirds the moment of stability as measured by dead loads unless the structure is anchored to the foundation by anchor bolts designed to carry the excess overturning moment without exceeding the stresses prescribed.

Hydrostatic and Earth Pressures

Par. 6054. Lateral pressures due to the weight of earth, water or other materials, computed in accordance with accepted engineering principles, approved by the Buildings Engineer, shall be used in designing walls and similar structures. Due allowance shall be made for possible surcharges from fixed or moving loads.

In the design of basement floors and similar structures below ground level, the upward pressure of water, if any, in the supporting soil shall be taken as the full hydrostatic pressure applied over the entire area.

Lateral Forces on Crane Girders

Par. 6055. The horizontal thrust on the top flange of a crane girder shall be taken as 10 per cent of the wheel loads on the girder.

Traction Forces on Crane Girders

Par. 6056. A braking force due to stopping of power driven cranes shall be assumed as 10 per cent of the wheel loads and may be considered as distributing itself along the entire length of the runway or along one or more bays.

Lateral Forces on Railings

Par. 6057. A lateral force of the following values in pounds per lineal foot applied at the top of the rail shall be assumed in designing railings:

Stairways, passageways and balconies not more than 4 feet wide	20
Stairways, passageways and balconies more than 4 feet but not exceeding 8 feet in width	50
Areas more than 8 feet wide	100

Special Lateral Forces

Par. 6058. All other forces to which a building or other structure or parts thereof may be subject and which are not specifically mentioned herein shall be given due consideration to the satisfaction of the Buildings Engineer in the design of such building or structure.

SECTION 606

LOAD TESTS

When Load Tests Shall Be Made

Par. 6060. The Buildings Engineer shall have the right to order a test under load of any completed portion of a building or other structure when the conditions have been such as to leave reasonable doubt as to the adequacy of the structure to serve the purpose for which it was intended. Such tests shall not be required to be made on any concrete or masonry construction until it is at least 60 days old. Floor or roof tests shall be conducted on not less than one entire panel.

Amount of Test Load

Par. 6061. The superimposed test load shall be twice the live load assumed in designing the part of the building or structure under test.

Load Test Requirements

Par. 6062. The test load shall be left in position for a period of 24 hours before removal. The part being tested shall be considered to have passed the test if within 24 hours after the removal of such load, it recovers three-quarters of its maximum deflection while under the load.

If the part shows evident failure or fails to meet the recovery requirements, such necessary changes or modifications shall be made so that the part will be adequate for the rated capacity and meet with the approval of the Buildings Engineer.

Supervision of Load Tests

Par. 6063. All load tests shall be made under the supervision of the Buildings Engineer and at the expense of the owner or builder of the building or other structure.

CHAPTER 61

MASONRY MATERIALS

Sec. 610—General Requirements for Masonry.
Ses. 611—Brick.
Sec. 612—Cast Stone.
Sec. 613—Plain Concrete.
Sec. 614—Concrete Blocks.
Sec. 615—Plain Gypsum.
Sec. 616—Stone.
Sec. 617—Structural Clay Tile.
Sec. 618—Special Masonry Materials.
Sec. 619—Masonry Mortar.

SECTION 610

GENERAL REQUIREMENTS FOR MASONRY

Quality of Masonry Materials

Par. 6101. The quality and manner of assembly of the materials used in the construction of masonry buildings and other structures, or parts thereof, shall be suitable for their use, and shall conform to the minimum requirements of this Chapter.

Classification of Masonry Materials

Par. 6102. The materials entering into masonry shall be classified for the purpose of this Code as follows:

Brick.
Cast Stone.
Concrete, plain or blocks.
Gypsum, blocks or poured-in-place.
Stone.
Structural Clay Tile.
Special Masonry Material.
Mortar.

Other Masonry Materials

Par. 6103. A masonry material, other than those classified in Paragraph 6102, which is incombustible and otherwise sufficiently embodies the characteristics of a classified material, and which satisfies the requirements for that material, shall be included by the Buildings Engineer in the classification of that material which it most closely resembles.

Allowable Compressive Stresses for Masonry

Par. 6104. The compressive stresses in pounds per square inch on the gross area of masonry, when "h" is equal to or less than "10d", shall not exceed one-tenth of the ultimate crushing strength of the units as placed in the masonry, nor the following values:

TABLE 6104T

	Mortars				
Masonry Units	Cement Portland	Lime-Cement	Cement-Lime	Lime	Gypsum
Cut Stone:					
Granite	800	640	225	100	
Gneiss	750	640	225	100	
Limestone	500	400	225	100	
Marble	500	400	225	100	
Sandstone	300	250	175	100	
Rubble Stone	140	110	90	70	
Brick:					
Grade A	400	200	150	100	
Grade B	250	175	120	80	
Second-hand Brick	200	150	100	80	
Grade C	170	120	100	60	
Hollow Walls ...	125	100	80	50	
Concrete:					
Blocks	200	150			
Cast Stone	400	200	100		
Clay and Shale:					
Structural Tile:					
Cells Vertical. .	100	80	50		50*
Cells Horizontal	80	70	40		40*
Solid Blocks:					
Grade A	400	200	150	100	
Grade B	250	175	120	80	

*For unglazed non-load-bearing tile only.

Concentrated loads shall be distributed so that the bearing under the load does not exceed the values given in the above table by more than 25 per cent.

Reduction In Allowable Compressive Stresses In Masonry Piers and Walls

Par. 6105. The allowable compressive stress for masonry piers, buttresses and pilasters with a height exceeding 10 times the least lateral dimension, and for masonry bearing walls with a height or clear distance between lateral supports exceeding 10 times the least thickness of the wall, shall be the reduced stress obtained from the following formula:

$$f_c = 1.5f\left(1-\frac{h}{30d}\right)$$

In which:

d = least horizontal dimension of a pier in feet or least thickness of wall

f = allowable compressive stress when h is equal to or less than $10d$.

f_c = allowable compressive stress when h is greater than $10d$.

h = height of pier in feet; the height, or clear distance between lateral supports, of a wall, in feet.

Allowable Stresses In Reinforced Brick Masonry

Par. 6106. The stresses in pounds per square inch for reinforced brick masonry, made of Grade A or B brick, shall not exceed the following values:

Compression, extreme fiber stress in bending....	400
Shear, no web reinforcement..................	25
Shear, with web reinforcement taking entire shear	50
Bond, deformed bars, vertical..................	60
horizontal.............	80
Modulus of elasticity.........................	1,200,000

Direct compressive stresses for reinforced brick masonry shall not exceed the values given for plain brick masonry in Paragraph 6104.

The tensile stress for steel reinforcement shall not exceed 16,000 pounds per square inch.

Methods of Masonry Design

Par. 6107. For the design of walls, piers and footings of masonry, refer to Part VII and for the design of masonry retaining walls, refer to Section 496.

In the design of reinforced brick masonry, the assumptions and formulas specified for reinforced concrete design in Chapter 65 shall be used.

SECTION 611

BRICK

Classification of Brick

Par. 6110. Brick, as classified in this code, shall include masonry units about 2¼″ thick, 3¾″ wide, and 8″ long. They shall be made of either clay, shale, concrete, sand and lime or any other material whose chief characteristics are plasticity when wet, and a rocklike hardness after being heated to a high temperature or otherwise processed. All brick used in building construction shall be of a good quality and of sufficient strength for the purpose intended and shall be classified according to their strength as follows:

TABLE 6110T

Grade	Compressive Strength Pounds per sq. in. of Gross Area		Modulus of Rupture Pounds per sq. in. of Gross Area	
	Average of 5 Tests	Individual Minimum	Average of 5 Tests	Individual Minimum
A	4500 or more..	3500	600 or more..	400
B	2500 to 4500...	2000	450 to 600....	300
C	1250 to 2500...	1000	300 to 450....	200

Brick with cored holes, the volume of which does not exceed 25 per cent of the gross volume of the brick, may be considered as solid brick and substituted therefor.

Clay Brick

Par. 6111. Brick of burned clay or shale shall be of good quality free from cracks, warpage, stones, pebbles or particles of lime that would effect their servicability or strength and shall be equal in strength to one of the three grades shown in Paragraph 6110.

Clay brick shall conform to the following absorption requirements:

TABLE 6111T

	Water Absorption by 5 hour Boiling Per Cent		C/B Ratio*	
	Maximum Average of 5 Bricks	Individual Maximum	Maximum Average of 5 Bricks	Individual Maximum
Grade A or B...	20	25	0.85	0.90

* The ratio C/B is the ratio of absorption by 24 hours submersion in cold water to that of 5 hours submersion in boiling water.

Concrete Brick

Par. 6112. Brick made of concrete shall be of good quality and equal in strength to one of the three grades shown in Paragraph 6110. They shall have an average absorption in 24 hours of not over 10 per cent by weight of cold water and not more than 12 per cent for any one brick. Materials used in concrete brick shall meet the requirements of Chapter 64.

Sand-Lime Brick

Par. 6113. Sand-lime brick shall be sound, of compact structure, reasonably uniform in shape, and shall be equal in strength to one of the three grades shown in Paragraph 6110.

Second-Hand Brick

Par. 6114. Second-hand brick shall be of hard-burned quality, whole, not spalled or chipped, and shall be thoroughly cleaned before being used. No second-hand salmon brick shall be permitted in any masonry.

Use Limitations for Brick

Par. 6115. Brick for load-bearing masonry or masonry exposed to the weather or soil shall be of Grades A or B, or second-hand brick, except that sand-lime brick shall not be used in masonry where they will be exposed to the weather or soil.

Tests for Brick

Par. 6117. All brick shall be tested for compression, flexure and absorption in accordance with the "Standard Methods of Testing Brick" of the American Society for Testing Materials, Serial Designation C67-39.

SECTION 612

CAST STONE

Requirements for Cast Stone

Par. 6120. Cast stone shall be made of Portland cement, aggregate and water, with or without admixtures, precast and set in place. Cast stone for load-bearing masonry or masonry exposed to the weather shall have a minimum compressive strength at an age of 28 days of 4500 pounds per square inch.

Allowable Bending Stress for Cast Stone

Par. 6121. The bending stress for cast stone shall not exceed 8 pounds per square inch.

SECTION 613

PLAIN CONCRETE

Scope of Plain Concrete

Par. 6130. Plain concrete shall include concrete poured in place and not reinforced, or reinforced only for shrinkage or changes in temperature.

Requirements for Plain Concrete

Par. 6131. Plain concrete shall conform to the requirements of Chapters 64 and 66.

Allowable Stresses for Plain Concrete

Par. 6132. The stresses for plain concrete shall not exceed the values given in Section 651 insofar as they are applicable. Tensil stresses are not permitted except in footings.

SECTION 614

CONCRETE BLOCKS

Scope of Concrete Blocks

Par. 6140. Concrete blocks shall include solid and hollow masonry wall units of concrete made of Portland cement, water and suitable aggregates, such as sand, gravel, crushed stone, bituminous or anthracite cinders, burned clay or shale, and blast furnace slag.

Materials for Concrete Blocks

Par. 6141. The material for concrete blocks shall conform to the requirements for the materials of concrete specified in Chapter 64, except that cinder aggregate for load-bearing concrete blocks shall contain not more than 20 per cent, and for non-load-bearing blocks not more than 35 per cent of combustible matter. Hydrated lime, not to exceed 10 per cent of the volume of the cement, may be added to the mixtures for concrete blocks.

Requirements for Load-Bearing Concrete Blocks

Par. 6142. Concrete blocks with less than 25 per cent core space shall be classed as solid and all other concrete blocks shall be classed as hollow. The volume of core space in any concrete block shall not exceed 50 per cent of the total volume of the block.

The ultimate compressive strength in pounds per square inch of gross cross-sectional area of hollow load-bearing concrete blocks at 28 days, when tested in a position such that the load is applied in the same direction as in service, shall be not less than 700 for the average of five blocks, no one of which shall fall below 600.

The ultimate compressive strength in pounds per square inch of gross cross-sectional area of solid concrete blocks at 28 days, when tested in a position such that the load is applied in the same direction as in service, shall be not less than 1500 for the average of five blocks, no one of which shall fall below 1200.

The absorption of five load-bearing concrete blocks, when dried to a constant weight at a temperature between 200 and 250 degrees Fahrenheit and immersed completely in clear water for a period of 24 hours, shall average not more than 12 per cent by weight.

Requirements for Non-Load-Bearing Hollow Concrete Blocks

Par. 6143. The ultimate compressive strength in pounds per square inch of the gross cross-sectional area of hollow non-load-bearing concrete block shall be not less than 350 for the average of five blocks, no one of which shall fall below 300.

The face shell thickness of such blocks shall be not less than one-half inch.

Identification Marks

Par. 6144. Every concrete block shall have the manufacturer's identification mark, approved by the Buildings Engineer, clearly moulded in it.

Hollow concrete blocks shall also bear a mark showing whether they are load-bearing or non-load-bearing units.

Tests for Concrete Blocks

Par. 6145. Tests made to determine the required qualities of concrete blocks shall be in accordance with the test methods described in the "Standard Specifications and Tests for Load-Bearing Concrete Masonry Units" of the American Society for Testing Material, Serial Designation C90-36.

SECTION 615

PLAIN GYPSUM

Scope of Plain Gypsum

Par. 6150 Plain gypsum shall include blocks, tiles and gypsum poured in place and not reinforced. For reinforced gypsum construction, refer to Chapter 67.

Gypsum Masonry Materials

Par. 6151. Materials for gypsum masonry shall meet the requirements of Section 671 insofar as they apply.

Gypsum Tiles or Blocks

Par. 6152. Gypsum tiles or blocks shall meet the requirements of the "Standard Specifications for Gypsum Tile or Block" of the American Society for Testing Materials, Serial Designation: C52-33.

Prohibited Use of Gypsum Masonry

Par. 6153. Gypsum masonry shall not be used for exterior walls; for load-bearing walls; in contact with earth; nor in laundries, refrigeration plants, or similar locations subject to vapor or steam.

SECTION 616

STONE

Quality of Stone

Par. 6160. Stone for masonry shall be sound, hard and durable, and of a quality suitable for the intended use.

Allowable Stresses for Stone

Par. 6163. The compressive stresses in stone shall not exceed those permitted for stone masonry in Paragraph 6104.

The bending stresses in pounds per square inch for sound stones shall not exceed the following values, unless tested according to Paragraph 6164, when one-fourth the ultimate strength may be used:

Granite	180
Gneiss	150
Limestone	120
Marble	120
Sandstone	80

Flexure Test for Stone

Par. 6164. The extreme fiber stress of stones shall be determined by the "Standard Method of Flexure Testing of Natural Building Stone", of the American Society for Testing Materials, Serial Designation C99-36.

SECTION 617

STRUCTURAL CLAY TILE

Scope of Structural Clay Tile

Par. 6170. Structural clay tile shall include all hollow units of burned clay or shale, such as partition tile, load-bearing tile, floor tile, blocks for chimneys and used for partitions, walls, floors, roofs, chimneys and other purposes requiring structural strength and stability.

Structural Clay Partition Tile

Par. 6171. Structural clay tile, used for partitions, furring, or fire proofing, when unexposed to the weather, shall meet the requirements of the "Standard Specifications for Structural Clay Non-Load-Bearing Tile", of the American Society for Testing Materials, Serial Designation C56-39. Clay tile exposed to the weather shall meet the requirements of Paragraph 6172.

Structural Clay Load-Bearing Tile

Par. 6172. Structural clay load-bearing tile shall meet the requirements of the "Standard Specifications for Structural Clay Load-Bearing Tile" of the American Society for Testing Materials, Serial Designation C34-39.

Structural clay load-bearing tile exposed to the weather shall be of Class LBX.

Structural clay load-bearing tile not exposed to the weather or where protected from the weather by a facing of stone, brick or other masonry not less than 3 inches thick shall be of Class LB or Class LBX.

Structural Clay Floor Tile

Par. 6173. Structural clay floor tile used as fillers or arches shall meet the requirements of the "Standard Specifications for Structural Clay Foor Tile" of the American Society for Testing Materials, serial Designation C57-36.

The requirements for the minimum weights for structural clay floor tile shall be waived if the over-all thickness of the shell measured between the inner and extreme outer surface is not less than five-eights inch and the thickness of the web is not less than one-half inch.

Tests On Structural Clay Tile

Par. 6174. Structural clay tile shall be tested according to the "Standard Methods of Sampling and Testing Structural Clay Tile", of the American Society for Testing Materials, Serial Designation C112-36.

Structural Clay Chimney Tile

Pa. 6175. Structural clay chimney tile shall have a total area of perforations of not more than 35 per cent of the cross sectional area and shall be made to conform with the circular or radial lines of the shaft. The tile shall be molded from refractory clay, and shall be sound ringing, hard burned, well shaped, free from checks, and weather and acid proof. They shall have a water absorption of not more than 10 per cent of the dry weight when immersed in clear water for a period of 24 hours. The individual crushing strength of the tile shall be not less than 3500 pounds per square inch of gross area.

SECTION 618

SPECIAL MASONRY MATERIALS

Scope of Special Masonry Materials

Par. 6180. Special masonry materials include architectural terra cotta, glass blocks, blocks of clay or shale and other similar special masonry materials used for facing masonry walls or other special purposes.

Architectural Terra Cotta

Par. 6181. Architectural terra cotta, including glazed tile and glazed hollow brick, shall meet the requirements of Paragraph 6171 for structural clay partition tile, except if used as load bearing units, in which case they shall be in accordance with Paragraph 6172.

The volume of voids in architectural terra cotta ashlar shall not exceed 40 per cent of the gross volume of the block.

Glass Blocks

Par. 6182. Glass blocks used in walls shall have an over-all thickness of not less than three and three-quarter inches. Their mortar surfaces shall have satisfactory alkali and moisture-resistant and bonding properties.

They shall not be used as load-bearing masonry, but shall be permitted only for the protection of openings and for partitions.

Clay or Shale Blocks

Par. 6183. Clay or shale units exceeding in size the requirements for brick shall be classed as blocks.

Blocks of clay or shale shall meet the requirements for physical properties of brick as specified in Paragraphs 6110 and 6111. They may be used wherever brick is required.

Other Special Masonry Material

Par. 6184. The Buildings Engineer may approve other special masonry materials, establish working stresses for masonry of such materials, and otherwise limit their use.

SECTION 619

MASONRY MORTARS

General Requirements for Masonry Mortars

Par. 6190. Masonry mortars shall be defined as a cementatory mixture used for the purpose of cementing masonry units together.

Masonry mortars shall be classified as Portland cement mortars, cement-lime mortars, lime-cement mortars, lime mortars, gypsum mortars, and special mortars.

Sand for all mortars shall meet the requirements of fine aggregates, Paragraph 6421, with the exception of the grading requirements in Table 6421T2. Sand for mortars shall be well graded and contain a sufficient amount of the finer sizes to provide a suitable degree of workability. The use of a sand finer than one which is well graded up to a No. 16 sieve shall be avoided.

Cementing materials for mortars shall meet the requirements for these materials in Paragraphs 6191 to 6197, inclusive.

Water shall meet the requirements of Paragraph 6440.

Mortars shall not be retempered for use.

Portland Cement Mortar.

Par. 6191. Portland cement mortar shall be composed of one part cement and not more than three parts of sand by volume with an allowable addition of lime putty or hydrated lime not to exceed 20 per cent by volume of the cement content.

The cement shall meet the requirements of standard Portland Cement, Paragraph 6412 or high early strength Portland Cement, Paragraph 6413.

The hydrated lime and lime putty shall meet the requirements for these materials in Paragraph 6194.

Cement-Lime Mortar

Par. 6192. Cement-lime mortar shall be composed of one part cement, one part hydrated lime or one part lime putty and not more than six parts of sand by volume.

The cement shall meet the requirements of standard Portland cement, Paragraph 6412, or high early strength Portland cement, Paragraph 6413.

Hydrated lime and lime putty shall meet the requirements for these materials in Paragraph 6194.

Lime-Cement Mortars

Par. 6193. Lime-cement mortars shall be composed of one part cement, two parts of hydrated lime or two parts of lime putty and not more than nine parts of sand by volume.

The cement shall meet the requirements of standard Portland cement, Paragraph 6412, or high early strength Portland cement, Paragraph 6413.

Hydrated lime and lime putty shall meet the requirements for these materials in Paragraph 6194.

Lime Mortar

Par. 6194. Lime mortar shall be composed of hydrated lime or lime putty and sand prepared and mixed in accordance with the instructions on the lime container, but in no case shall the lime mortar be composed of more than three parts sand to one part hydrated lime or lime putty.

All containers for lime used in mortars shall bear complete instructions as to preparation and mixing. All limes shall have the written approval of the Buildings Engineer.

Hydrated lime shall conform to the requirements of the "Standard Specifications for Hydrated Lime for Structural Purposes", of the American Society for Testing Materials, Serial Designation C6-31.

Quicklime shall conform to the requirements of the "Standard Specifications for Quicklime for Structural Purposes", of the American Society for Testing Materials, Serial Designation C5-26.

Pulverized quicklime shall be of such size that 100 per cent will pass a No. 20 sieve and not less than 90 per cent will pass a No. 50 sieve.

Putty prepared from quicklime shall weigh not less than 80 pounds per cubic foot.

Air slaked lime shall not be permitted in mortars.

Gypsum Mortar

Par. 6195. Gypsum mortar shall be composed of one part gypsum and not more than three parts of sand by weight.

Gypsum shall meet the requirements of Paragraph 6710.

Masonry Cement Mortars

Par. 6196. Masonry cement mortars shall be mixed according to the instructions on the cement container. When complete instructions do not appear on the container, the mortar shall be composed of one part of masonry cement and not more than 2.5 parts of sand by volume.

Masonry cements must have the written approval of the Buildings Engineer before being used.

When the masonry cement meets the physical requirements of standard Portland cement, Paragraph 6412, the mortar shall be classified as Portland cement mortar.

When the masonry cement meets the requirements of the "Tentative Specifications for Masonry Cements", of the American Society for Testing Materials, Serial Designation C91-38T, the mortar shall be classified as cement-lime mortar.

When the masonry cement meets the requirements of the "Federal Specification SS-C-181b for Type I Masonry Cement", the mortar shall be classified as the lime-cement mortar.

Special Mortars

Par. 6197. All special mortars shall have the approval of the Buildings Engineer.

Permissible Use of Mortars

Par. 6198. Portland cement mortars shall be used in reinforced brick masonry except where grout is used, and in all masonry under water, and shall be permitted in any type of masonry except gypsum masonry.

Cement-lime mortar shall be permitted, unless limited by stress, in all types of masonry, except gypsum masonry and masonry specifically requiring Portland cement mortar.

Lime-cement mortar shall be permitted, unless limited by stress, only in interior masonry walls and in exterior masonry walls made of brick, except where such walls are in contact with soil.

Lime mortar shall be permitted, unless limited by stress, only in interior walls of solid units and in exterior brick walls of small dwellings not over two stories or 30 feet in height, except where such walls are in contact with soil.

Gypsum mortar shall be used with gypsum units. It shall not be permitted elsewhere, except in setting up unglazed nonload bearing hollow clay tile.

Masonry mortars shall be permitted only in accordance with their classification.

Special mortars shall be permitted only in the locations for which they have been approved.

CHAPTER 62

WOOD CONSTRUCTION

Sec. 620—General Requirements for Wood Construction.
Sec. 621—Wood Materials.
Sec. 622—Allowable Stresses for Wood Construction.
Sec. 623—Design of Wooden Beams and Trusses.
Sec. 624—Design of Wooden Compression Members.
Sec. 625—Wood Fastenings.
Sec. 626—Wood Connectors.
Sec. 627—Preservative Treatment of Wood.
Sec. 628—Plywood.

SECTION 620

GENERAL REQUIREMENTS FOR WOOD CONSTRUCTION

Scope of Wood Construction

Par. 6200. This Chapter defines the limits governing the quality, design, fabrication and installation of all wood used for load supporting members in buildings and other structures, except as otherwise specifically defined in other parts of this Code.

Wood Under Conditions Favorable to Decay

Par. 6201. Except as specifically permitted or required in Chapter 70 for piles, pile caps and wooden footings, wooden structural members in the following locations favorable to decay shall be governed by the requirements of this Paragraph:

a. Where alternately immersed in water and exposed to air, except when they are intended to support buildings of Types F and G if the portion of the members above permanent water level will be readily available for inspection.

b. In contact with the earth.

c. Within 24 inches of usually wet earth or other similar wet places or within 18 inches of other earth, unless the earth or wet place is sealed with an impervious wall or covering of dense cement concrete or other approved material.

Such wooden structural members shall be:

Preservatively treated as required in Section 627, or
The 85 per cent heartwood of
  tidewater red cypress
  western red cedar

redwood containing hot-water extractive in amount above 15 per cent of the dry weight of the wood, or

The 85 per cent heartwood of the following species if the extreme fiber stress in bending or the compressive stress perpendicular or parallel to the grain does not exceed 50 per cent of the allowable stresses tabulated in Paragraphs 6220 and 6221:

Douglas fir
White oak
Southern yellow pine
Red gum
Other species of similar durability, under the aforementioned conditions favorable to decay.

Workmanship for Wood Construction

Par. 6202. Workmanship in fabrication, preparation, installation, joining of wooden members and the connectors and mechanical devices for the fastening thereof, shall conform throughout to good engineering practice.

Framing Wooden Members

Par. 6203. All wooden members shall be so framed, anchored, tied and braced together as to develop the strength and rigidity necessary for the purposes for which they are used.

Sizes of Wooden Members

Par. 6204. The minimum sizes of wooden members required by this Code refer to nominal sizes. American Lumber Standard dressed sizes shall be accepted as minimum net sizes conforming to corresponding nominal sizes of lumber, and these net sizes shall be used as a basis for computations to determine the required sizes of members. If rough sizes or finished sizes exceeding American Lumber Standard dressed sizes are to be used, computations may be predicated upon such actual sizes, if they are specified on the drawings or in the specifications. For convenience, nominal sizes may be shown on the drawings.

Symbols and Notations for the Design of Wood Construction

Par. 6205. Unless otherwise given in the Paragraphs where they occur, the symbols and notations used in the design of wood construction are as follows:

b—width of beam, in inches

c—allowable compressive stress parallel to the grain, in pounds per square inch
D—diameter of nail, spike, screw or bolt, in inches
d—total depth of a beam, in inches; least lateral dimension of a column, in inches
F—allowable reduced extreme fiber stress, in pounds per square inch
f—allowable extreme fiber stress, in pounds per square inch
G—specific gravity of the wood
h—depth of a beam at a notch, in inches
l—unsupported length of column or beam, in inches
N—allowable compressive stress on the inclined surface, in pounds per square inch
q—allowable compressive stress across the grain, in pounds per square inch
∅—angle between direction of the pressure and the direction of the grain
V—total shear on a section, in pounds
v—unit shear on a section, in pounds per square inch.

SECTION 621

WOOD MATERIALS

Quality of Wood

Par. 6210. Structural wood of the species listed in the tables of allowable unit stresses in Section 622 shall conform to the requirements for the several grades in specifications or grading rules of regional associations of lumber manufacturers which are based upon the grading procedure of American Lumber Standards in Simplified Practice of the United States Department of Commerce and the Guide to the Grading of Structural Timbers and the Determination of Working Stresses, Miscellaneous Publication No. 185 of the United States Department of Agriculture. The lumber of the several grades and species shall be so specified as to justify the allowable stresses in accordance with the said Guide to the Grading of Structural Timbers and the Determination of Working Stresses.

Branded Wood

Par. 6211. No wood shall be permitted to carry the stresses allowed in Paragraphs 6220 and 6221 unless each piece of such wood shall be branded or otherwise identified as being of such species and grade by some organization acceptable to the Buildings Engineer as competent to establish such grades.

SECTION 622

ALLOWABLE STRESSES FOR WOOD CONSTRUCTION

Allowable Stresses for Wood

Par. 6220. The stresses, in pounds per square inch, for wood, except columns, shall not exceed the following values:

TABLE 6220T

Stress-Grade and Species	Specific Gravity	Extreme Fiber Stress in bending	Horizontal Shear	Compression Perpendicular to Grain	Modulus of Elasticity
1400#f tidewater red cypress.....	0.34	1400	120	300	1,200,000
1100#f tidewater red cypress.....		1100	100		
1400#f southern cypress	0.48	1400	120	300	1,200,000
1100#f southern cypress		1100	100		
1800#f dense douglas fir (coast region)	0.51	1800	120	380	1,600,000
1600#f close-grained douglas fir (coast region)		1600	100	345	
1200#f douglas fir (coast region).		1200*	100	325	
1800#f dense douglas fir (inland empire)	0.51	1800	120	380	1,600,000
1600#f close-grained douglas fir (inland empire)		1600	85	335	1,500,000
1200#f douglas fir (inland empire)		1200	80	315	1,500,000
1400#f gum, black and red.......	0.55	1400	100	300	1,200,000
1200#f gum, black and red.......		1200	100		
1000#f gum, black and red.......		1000	100		
1100#f Eastern hemlock	0.43	1100	70	300	1,100,000
1040#f West coast hemlock.......	0.44	1040*	100	300	1,400,000
1800#f oak, red and white........	0.68	1800	120	500	1,500,000
1600#f oak, red and white........		1600	120		
1400#f oak, red and white........		1400	120		
1200#f oak, red and white........		1200	100		
2000#f dense longleaf sou. pine..	0.58	2000	100	380	1,600,000
1800#f dense 1.1 sou. pine........		1800			
1600#f dense 1.1 sou. pine........		1600			
1400#f dense 1.1 sou. pine........		1400			
1050#f dense 1.1 sou. pine........		1050			
2000#f dense shortleaf sou. pine..	0.58	2000	100	380	1,600,000
1800#f dense s. l. sou. pine.......		1800			
1600#f dense s. l. sou. pine.......		1600			
1400#f dense s. l. sou. pine.......		1400			
1200#f short leaf sou. pine.......		1200			
1050#f dense s. l. sou. pine.......		1050			
900#f short leaf sou. pine.......		900			
1600#f close-grained redwood	0.39	1600	80	267	1,200,000
1400#f close-grained redwood		1400	80		
1200#f close-grained redwood		1200	70		
1200#f eastern spruce	0.39	1200	90	250	1,200,000
1100#f eastern spruce		1100	80		
1000#f eastern spruce		1000	80		

* With slope of grain not more than 1 to 10.

For stresses in compression parallel to grain, see Paragraph 6221.

For members in direct tension, the allowable stresses for the respective grades are the same as the extreme stresses in bending.

In joists supported on a ribbon or ledger board and spiked to the studding, the allowable stress in compression perpendicular to the grain may be increased 50 per cent.

The unit stress in compression perpendicular to the grain in a limited area not over 6 inches long along the grain nor less than 3 inches from the end of the timber may exceed the tabulated values by not more than the following percentages:

Length of Bearing (inches)	Percentage Excess
½	85
1	60
1½	45
2	30
3	15
4	10
6 or more	None

Intermediate values shall be determined by interpolation. The bearing stress under a washer or small plate shall not exceed that provided herein for a bearing the length of which equals the diameter of the washer or plate.

The allowable horizontal shearing stresses given in the table are based on the maximum amount of checking, due to shakes or seasoning, permitted by the grading rules for the species and grade in question. Lumber with greater checking than is permitted in the grading rules may be used in structures with the approval of the Buildings Engineer if the unit shear is proportionately less than the tabulated values.

The unit shear in joint or connection details of wooden trusses or framing may exceed the tabulated horizontal shear values by not more than 50 per cent.

Allowable Stresses for Columns and Other Compression Members

Par. 6221. The compressive stresses, in pounds per square inch, parallel to the grain on the net cross-sectional area of solid wooden columns and other solid compression members for various ratios of length to least dimensions, $\frac{l}{d}$, shall not exceed the following values:

TABLE 6221T

Stress-Grade and Species	Values of $\frac{l}{d}$									
	11 or less	14	17	20	23	26	30	35	40	50
1200‡c tidewater red cypress.	1200	1110	1000	820	620	490	360	270	206	13
1000‡c tidewater red cypress.	1000	950	880	780						
1200‡c southern cypress ...	1200	1110	1000	820	620	490	360	270	206	13
1000‡c southern cypress ...	1000	950	880	780						
1300‡c dense Douglas fir (coast region)	1300	1230	1160	1030	830	650	490	360	274	17
1200‡c close-grained Douglas fir (coast region)..	1200	1150	1090	990	830					
1100‡c Douglas fir (coast region)	1100	1060	1010	940	810					
880‡c Douglas fir (coast region)	880	860	840	800	700					
1300‡c dense Douglas fir (inland empire) ..	1300	1230	1160	1030	830	650	490	360	274	17
1200‡c close-grained Douglas fir (inland empire)	1200	1130	1070	960	780	610	460	340	257	16
1100‡c Douglas fir (inland empire)	1100	1050	1010	910	770					
900‡c gum, black and red..	900	860	820	740	620	490	360	270	206	13
700‡c Eastern hemlock ...	700	680	650	610	550	450	330	246	188	12
720‡c west coast hemlock.	720	710	690	660	610	550	450	310	240	15
1100‡c oak, red and white..	1100	1050	1000	910	770	610	460	340	257	16
1000‡c oak, red and white..	1000	970	920	860	750					
900‡c oak, red and white..	900	880	850	800	720					
1450‡c dense long-leaf southern pine	1450	1360	1250	1080	830	650	490	360	274	17
1300‡c dense long-leaf southern pine	1300	1230	1160	1030	830					
1200‡c dense long-leaf southern pine	1200	1150	1090	990	830					
1000‡c dense long-leaf southern pine	1000	970	930	880	780					
1450‡c dense short-leaf southern pine	1450	1360	1250	1080	830	650	490	360	274	17
1300‡c dense short-leaf southern pine	1300	1230	1160	1030	830					
1200‡c dense short-leaf southern pine	1200	1150	1090	990	830					
900‡c dense short-leaf southern pine	1000	970	930	880	780					
1200‡c close-grained redwood	1200	1110	1000	820	620	490	360	270	206	13
1100‡c close-grained redwood	1100	1030	950	810						
1000‡c close-grained redwood	1000	950	880	780						

The compressive stresses for ratios of length-to-least dimension intermediate of those given in the table may be obtained by interpolation.

Stresses for Species and Grades Not Tabulated

Par. 6222. For species and grades not given in the preceding tables, the stresses therefor shall be established by the Buildings Engineer in accordance with the principles in the "Guide to the Grading of Structural Timbers and Determination of Working Stresses", Miscellaneous Publication No. 185, of the United States Department of Agriculture.

Allowable Compressive Stress on Inclined Wood Surfaces

Par. 6223. The compressive stress in pounds per square inch on wood surfaces inclined to the grain or for wood members acted on by a force forming an angle with the grain shall not exceed the following value:

$$N=\frac{cq}{c\sin^2\varnothing+q\cos^2\varnothing}$$

SECTION 623

DESIGN OF WOODEN BEAMS AND TRUSSES

Design of Wooden Beams for Flexure

Par. 6231. Simple wooden beams shall be designed by the accepted formula for flexure. Such wooden beams with laterally unsupported compression edges and whose ratio of depth to width exceeds three shall be so designed that the compressive stress, F, in pounds per square inch, does not exceed that given by the following formula:

$$F=f\left(1.5-\frac{l}{40b}\right)$$

Design of Wooden Beams for Shear

Par. 6232. The unit horizontal shear in a rectangular wooden beam as computed from the following formula shall not exceed the values specified in Paragraph 6220:

$$v=\frac{3V}{2bd}\text{ for unnotched beams}$$

$$v=\frac{3Vd}{2bh^2}\text{ for beams with square-cornered notches}$$

In computing shear for unnotched beams, the effect of uniform, concentrated static or moving loads within a distance from the support in question equal to or less than the height of the beam may be neglected. All concentrated loads located at a distance from the support of one to three times the height of the beam may be considered as placed at three times the height of the beam from the support. All other loads shall be considered in the usual manner.

Notches and Holes in Wooden Beams

Par. 6233. Unless the local unit stress is calculated and found to be not in excess of allowable stresses specified in Paragraph 6220, wooden beams shall not be cut, notched or bored to clear pipes, wires, conduits or for other purposes except as follows:

Holes may be bored in the middle third of the depth and length not larger in diameter than one-quarter the depth.

Holes may be bored in the piece limited as to size and placement the same as knots in the grade of lumber used, having due regard to the existence of knots in the piece.

Details of Built-Up Wooden Beams

Par. 6234. Beams built up of wood shall be firmly bolted together. Bolts shall be spaced longitudinally not farther apart than four times the depth of the beam.

Design of Wooden Trusses

Par. 6235. The compression members of trusses shall be designed in accordance with Section 624. The tension members shall be porportioned on the basis of their net sections. Connections shall be made with butt joints, steel straps, connectors, steel splices, plates, fishplates and bolts. The stress computed as transmitted by bolts and connectors shall not exceed the safe shearing value of the metal nor the values specified in Sections 625 and 626.

Top chords of all trusses shall be adequately braced laterally and the distance between such braces shall not exceed the length of such chords used in computing their carrying capacity.

SECTION 624

DESIGN OF WOODEN COMPRESSION MEMBERS

Classification of Wooden Compression Members

Par. 6240. Wooden columns and other members stressed in compression parallel to the grain shall be classified as solid, laminated and spaced.

Slenderness Ratio

Par. 6241. The ratio of unbraced length to the least lateral dimension, $\frac{l}{d}$, for solid columns and other solid compression members of wood shall not exceed 50.

Design of Solid Wooden Compression Members

Par. 6242. Except as hereinafter permitted, the safe axial load, P, in pounds, for solid wooden compression members, shall not exceed the value given by

$$P=Ac$$

in which A is the actual cross-sectional area, in square inches, of the column or other solid member stressed in compression parallel to the grain and c is the tabulated allowable compressive stress in Paragraph 6221 for the grade and species of the wood and the length-to-least dimension in question.

When solid wooden compression members are subjected to wind loads acting alone or in combination with other loads or to temporary or construction loads, the safe axial load shall not exceed the following values:

Short Columns; $\frac{l}{d}$ does not exceed 11

$$P=1.5Ac_1$$

Intermediate Columns; $\frac{l}{d}$ is greater than 11 but less than K

$$P=1.5Ac_1\left[1-0.75\left(\frac{l}{Kd}\right)4\right]$$

c_1=allowable unit stress in compression parallel to the
grain for short columns
grain for columns whose $\frac{l}{d}$ does not exceed 11.

$$K=0.64\sqrt{\frac{E}{c_1}}$$

E=modulus of elasticity

Long Columns; $\frac{l}{d}$ is equal to or greater than K

$$P=Ac$$

The safe axial load on a solid round wooden column shall not exceed that permitted for a square column of the same cross-sectional area.

The diameter of tapered columns shall be measured at a point one-third the length from the small end, and in no case shall it be assumed as more than one and one-half times the least diameter of its small end. The compressive stress at the small end shall not exceed the allowable stress for short columns.

Design of Laminated Wooden Compression Members

Par. 6243. The safe axial load on laminated wooden compression members built up of several pieces fastened together with spikes, bolts or timber connectors at intervals not exceeding six times the thickness of the thinnest piece shall not exceed 70 per cent of such load permitted on solid wooden compression members in Paragraph 6242.

Laminated wooden compression members shall be made either of four planks boxed around a solid wood core or of several pieces of wood bolted face to face with their edges tied together with cover plates.

Design of Spaced Wooden Compression Members

Par. 6244. Spaced wooden compression members, formed of two or more individual side members separated by blocking at the ends and middle points of their length and joined at the ends by approved timber connectors shall be designed using column formulas recommended by the Forest Products Laboratory, Forest Service, United States Department of Agriculture. (For data see Wood Columns, Safe Loads, a National Lumber Manufacturers Association publication, 1936).

Design of Other Wooden Compression Members

Par. 6245. Wooden compression members composed of two or more individual members to form such sections as T, H, U and L shall be designed as recommended by the Forest Products Laboratory, Forest Service, United States Department of Agriculture.

SECTION 625

WOOD FASTENINGS

Scope of Wood Fastenings

Par. 6250. Wood fastenings shall include bolts, nails, screws, spikes and other similar hardware used to connect wood members.

Lateral Resistance of Bolts

Par. 6251. *Bolts in Double Shear:* The safe lateral resistance in pounds of a common bolt in seasoned lumber of tidewater red cypress, coast and inland Douglas fir, southern longleaf and shortleaf pine and redwood, irrespective of grade, in joints consisting of three members in which the side members are at least one-half the thickness of the main member, shall not be taken greater than the following values:

TABLE 6251T

Length of Bolt in main member, in inches*	Diameter of Bolt in Inches						
	½	⅝	¾	⅞	1	1⅛	1¼
	Loads Parallel to Grain (p)						
2	960	1280	1550	1820	2080		
3	1050	1620	2160	2660	3090		
4	1050	1640	2360	3110	3850		
5	1050	1640	2360	3210	4160	5150	
6		1640	2360	3210	4190	5330	
7		1640	2360	3210	4190	5330	
8		1640	2360	3210	4190	5330	6550
10				3210	4190	5330	6550
12					4190	5330	6550
	Loads Perpendicular to Grain (q)						
2	460	520	570	640	700		
3	690	780	890	960	1050		
4	810	1040	1160	1280	1400		
5	780	1150	1440	1600	1750	1900	
6		1110	1540	1880	2100	2280	
7		1060	1500	1970	2390	2660	
8		980	1440	1940	2460	2940	3273
10				1800	2340	2970	3610
12					2180	2820	3460

* This assumes full size lumber, that is, not dressed sizes. Safe lateral resistance on dressed sizes may be obtained by interpolation.

Loads at Angle to Grain: The safe lateral resistance, n, in pounds, of a bolt when the force is applied at an angle with the grain of a wood member shall not be taken greater than that given by

$$n = \frac{pq}{p \sin^2 \theta + q \cos^2 \theta}$$

in which p=safe lateral resistance of bolt in pounds parallel to the grain
q=safe lateral resistance of bolt in pounds perpendicular to the grain
θ=angle between direction of load and direction of grain, in degrees

Bolts in Other Species of Wood: The safe lateral resistance of bolts in species of wood other than those specified in this Paragraph shall be determined in accordance with the principles in "Wood Handbook", United States Department of Agriculture, September, 1935.

Metal Side Plates: When metal plates are used for side members, the tabulated bolt value may be increased 25 per cent for values parallel to the grain.

Bolts in Other Than Double Shear: In joints consisting of two members of equal thickness, one-half the tabulated bolt value for a piece twice the thickness of one of the members shall be used. When members of a two-member joint are of unequal thickness, one-half the tabulated value for a piece twice the thickness of the thinner member shall be used.

In joints of more than three members, the bolt value for each shear plane shall be computed in the same manner as for a two-member joint.

Green Lumber: Where green or recently cut lumber is used, that is, lumber which has not been air-dried for at least 60 days, or which has not at the time of installation in the structure reached a moisture content approximately equal to that which it will eventually contain in service, the tabulated bolt values shall be reduced by one-third.

Joints in Wet Locations: When a joint is to be used in a location occasionally wet but quickly dried, the tabulated bolt values shall be reduced one quarter and in locations usually wet, they shall be reduced one third, except when the wood is creosoted, they shall be reduced one sixth and one fifth respectively.

Bolts: Bolts shall fill the hole completely without splitting the wood and shall be of sufficient length to allow the nut to be screwed up tight. Washers shall be used under nuts and, except on carriage bolts, under heads. Bolts with rolled threads shall not be used in shear.

Tabulated values are for common bolts with a yield point of approximately 45,000 pounds per square inch. Values for bolts of higher strength shall be derived in accordance with the principles stated in "Wood Handbook", United States Department of Agriculture, September, 1935.

Spacing of Bolts in Joints

Par. 6252. The spacing of bolts in a line parallel to the direction of the load shall be at least four bolt diameters.

The distance across the grain between rows of bolts acting parallel with the grain shall be such that the net tension area remaining at a critical section shall be not less than 80 per cent of the total area in bearing under all bolts in the particular member in question when of softwoods, and 100 per cent when of hardwoods.

The distance along the grain between rows of bolts acting perpendicular to the grain shall be not less than two and one-half times the bolt diameter for an $\frac{l}{d}$ ratio of 2, and not less than 5 times the bolt diameter for $\frac{l}{d}$ ratios of 6 or more. Intermediate values shall be directly interpolated.

In a tension joint, the distance from the end of a timber to the center of the nearest bolt hole shall be at least seven times the bolt diameter for softwoods, and at least five times the bolt diameter for hardwoods. When the joint is under a compressive load, this end margin need only be four times the bolt diameter for all woods.

The distance from the edge of a timber to the center of a bolt acting parallel with the grain shall be at least one and one-half times the bolt diameter. For loads acting perpendicular to the grain the margin between the edge toward which the bolt pressure is acting and the center of bolt or bolts to this edge should be at least four times the bolt diameter.

Bolt holes in wood members shall be of the same diameter as the bolt.

Lateral Resistance of Lag Screws

Par. 6253. The safe lateral resistance, P, in pounds, of a lag screw driven into a side-grain surface and bearing parallel to the grain of the wood shall be taken not greater than that given by

$$P = K\,D^2$$

in which the value of K for the various species of wood shall be taken as follows:

Group 1	Hemlock, eastern Spruce, eastern	1,500
Group 2	Cypress, southern Fir, Douglas, inland Hemlock, western Redwood	1,700
Group 3	Gum, black and red Fir, Douglas, westcoast Pine, southern longleaf Pine, southern shortleaf	1,900
	Oak, red and white	2,200

These values are based upon a cleat thickness of 3.5 times the shank diameter. For smaller ratios, the loads shall be reduced at the rate of 10 per cent for each unit of reduction in the ratio and for larger ratios, the loads may be increased 10 per cent for each unit of increase in the ration, but not to exceed 20 per cent, except that when metal cleats are used, the loads may be increased 25 per cent.

The penetration of a screw shall be not less than 11 shank diameters for Group 1 woods, 10 shank diameters for Group 2, 8.5 shank diameters for Group 3 and 7 shank diameters for oak, and the shank of the screw shall extend at least to the surface of contact between the main member and the cleat.

Withdrawal Resistance of Lag Screws

Par. 6254. The safe withdrawal resistance, P_1, in pounds per inch of penetration of a lag screw with standard rolled or cut threads in a side-grain surface shall be taken not greater than that given by

$$P_1 = 1{,}500\ D^{\frac{3}{4}} G^{\frac{3}{2}}$$

For such a lag screw placed parallel to the grain, the value of P shall be taken not greater than 75 per cent of the value given by the foregoing formula.

Placing Lag Screws

Par. 6255. All lag screws shall be screwed and not driven into place. In placing lag screws in wood, a hole shall first be bored of the same diameter and depth as the shank after which the hole shall be continued to a depth equal to the length of the lag screw and with a diameter equal to the following percentage of the shank diameter, the larger figure in each range applying to screws of the greater diameter:

Hemlock, eastern	40 to 70
Hemlock, west coast	
Redwood	
Spruce, eastern	
Cypress, southern	60 to 75
Fir, Douglas	
Gum, black and red	
Pine, southern longleaf	
Pine, southern shortleaf	
Oak, red and white	65 to 85

Spacing Lag Screws

Par. 6256. The spacing of lag screws in joints of wood shall be in accordance with the requirements of Paragraph 6252 insofar as they apply.

Resistance of Wood Screws

Par. 6257. The safe lateral resistance, P, in pounds, of wood screws driven perpendicular to the grain shall not be taken greater than that given by

$$P = K D^2$$

in which the value of K for the various species of wood shall be taken as follows:

Eastern hemlock	2100
Eastern spruce	2100
Southern cypress	2700
Western hemlock	2700
Douglas fir (inland Empire)	2700
Redwood	2700
Southern pine	3300
Douglas fir (coast region)	3300
Gum, black and red	2900
Oak, red and white	4000

The values of D and D^2 for various sizes of screws are as follows:

TABLE 6257T

Screw Number	D	D^2	Screw Number	D	D^2
0	0.060	0.0036	9	0.177	0.0313
1	0.073	0.0053	10	0.190	0.0361
2	0.086	0.0074	11	0.203	0.0412
3	0.099	0.0098	12	0.216	0.0467
4	0.112	0.0125	14	0.242	0.0586
5	0.124	0.0156	16	0.268	0.0718
6	0.138	0.0190	18	0.294	0.0864
7	0.151	0.0228	20	0.320	0.1024
8	0.164	0.0269	24	0.372	0.1384

The safe withdrawal resistance, P_1, in pounds, of a wood screw in a side grain surface shall be taken as not greater than that given by

$$P_1 = 1700\ G^2D$$

When screws are driven parallel to the grain and where splitting is avoided, the values shall be not more than 75 per cent of that computed for the side grain surface.

The penetration of the screw into the member receiving the point shall be at least seven times the screw diameter.

Lateral Resistance of Common Wire Nails and Spikes

Par. 6258. The safe lateral resistance, P, in pounds, of common wire nails and spikes driven at right angles to the grain shall not be taken greater than that given by

$$P = KD^{\frac{3}{2}}$$

in which the value of K for the various species of wood shall be taken as follows:

Eastern hemlock	900
Eastern spruce	900
Southern cypress	1125
Western hemlock	1125
Douglas fir (inland empire)	1125
Redwood	1125
Southern pine	1375
Douglas fir (coast region)	1375

Gum, black and red	1250
Oak, red and white	1700

The values of $D^{\frac{3}{2}}$ for the various sizes of common wire nails are as follows:

Fourpenny	0.0311
Sixpenny	0.0380
Eightpenny	0.0474
Tenpenny	0.0570
Twelvepenny	0.0570
Sixteenpenny	0.0652
Twentypenny	0.0841
Thirtypenny	0.0942
Fortypenny	0.1068
Fiftypenny	0.1205
Sixtypenny	0.1349

The safe lateral resistance of common wire nails and spikes driven parallel to the grain shall be taken as 60 per cent of the preceding values.

Spacing and Penetration of Nails and Spikes

Par. 6259. Nails and spikes shall not be driven closer together than one-half their length unless driven in bored holes nor closer to the edge of the timber than one-quarter their length. Holes for nails and spikes when necessary to prevent splitting shall be bored smaller in diameter than the nails or spikes. Nails and spikes shall be of such length that, when joining one timber to another, the penetration of the nail or spike in the timber receiving the point shall be not less than one-half their length.

SECTION 626

WOOD CONNECTORS

Scope of Wood Connectors

Par. 6260. Wood connectors shall include metal rings, plates, wood disks and similar devices which, when embedded partly in each of the adjacent wood members, transmit the load from one such member to the other.

Allowable Stresses for Wood Connectors

Par. 6261. Joints wherein timber connectors are used with bolts to transmit stresses between structural or load-bearing members shall be designed in accordance with the principles and recommended safe loads set forth in "Wood Handbook" published by the United States Department of Agriculture, September, 1935.

Safe loads and design practice for types of connectors not mentioned or fully covered by the above publication may be determined from other published recommendations, provided such recommendations are first approved by the Buildings Engineer. Allowable load values for timber connectors shall be based on empirical test data. Connector safe load values shall be determined from the combined resistance of the connector and its bolt.

Cylindrical Pins

Par. 6262. In connections involving the use of tightly fitting cylindrical pins of iron, steel, heavy steel pipe or hardwood, the allowable load on a pin shall be determined in the same manner as for bolts as set forth in the "Wood Handbook", published by the United States Department of Agriculture, September, 1935.

SECTION 627

PRESERVATIVE TREATMENT OF WOOD

Wood Preservatives

Par. 6270. *Preservative Oils:* The preservative oil used for the treatment of lumber, timber or piling shall be either creosote or creosote-coal tar solution.

The creosote shall be a distillate of coal-gas or coke-oven tar. The creosote coal-tar solution shall be a coal-tar product of which at least 80 per cent shall be a distillate of coal-gas tar or coke-oven tar, and the remainder shall be refined or filtered coal-gas tar or coke-oven tar. Creosote and creosote coal-tar solution shall conform to the following specification:

TABLE 6270T

Specification	Per Cent	
	Of the Creosote	Of the Creosote-Coal Tar Solution
1. It shall not contain water in excess of	3.00	3.00
2. It shall not contain matter insoluble in benzol in excess of*	0.50	2.00
3. The specific gravity at 38 degrees to 15.5 degrees Centigrade shall not be less than..	1.03	1.05
nor more than.............	....	1.12
4. The distillate based on water free oil shall be within the following limits:		
Up to 210 degrees Centigrade, not more than..............	5.00	5.00
Up to 235 degrees Centigrade, not more than..............	25.00	25.00
5. Coke residue of oil shall not exceed	2.00	6.00

*Samples of creosote or creosote coal-tar solution taken from working tanks may show an increase in matter insoluble in benzol due to treating operations. Such increases provided they do not exceed one per cent the specification limits should not serve to cause rejection of the creosote for non-conformity with specifications if it can be shown that the original fresh oil was of specified quality.

Sampling and Testing: Oil preservatives shall be sampled and tested in accordance with the requirements of the standard methods of the American Society for Testing Materials, as follows:

Sampling and Testing of Creosote,
Serial Designation D38-33
Test for Insoluble Matter in Creosote,
Serial Designation D367-33
Test for Water in Creosote,
Serial Designation D370-33
Test for Distillation of Creosote,
Serial Designation D246-39

Test for Specific Gravity of Creosote,
Serial Designation D368-33
Test for Coke Residue of Creosote,
Serial Designation D168-30

Conditioning Wood for Treatment

Par. 6271. The material shall be conditioned by air seasoning, by steaming, or by heating in oil either under vacuum or at atmospheric pressure, or by a combination of them as agreed upon, in such a manner as will not cause injurious checking, splitting or warping.

Air Seasoning: When air seasoning is used, the material shall be treated before it begins to decay. Kiln drying shall be accepted as the equivalent of air seasoning.

Steam Conditioning: When steam conditioning is used, the material shall be steamed in the cylinder at not more than 259 degrees Fahrenheit (approximately 20 pounds pressure per square inch), for not more than 20 hours, which temperature maximum shall not be reached in less than one hour. The duration of the steaming shall be based on consideration of the shape, cross-sectional area and moisture content of the material. The cylinder shall be provided with vents to relieve it of air and insure proper distribution of steam. After steaming is completed, a minimum vacuum of 22 inches at sea level shall be maintained for not less than 60 minutes nor more than 180 minutes. The cylinder shall be relieved continuously or frequently enough to prevent the condensate from accumulating in sufficient quantity to reach the wood. Before the preservative is introduced the cylinder shall be drained of condensate. Steam conditioning may be used only for southern yellow pine lumber timber and piles. Other species of wood must be conditioned by thorough air seasoning or heating in oil.

Heating in Oil: When conditioning by heating in oil is used, the oil shall cover the material in the cylinder. If a vacuum is then drawn, it shall be of sufficient intensity to evaporate the water from the material at the temperature of the oil. The temperature of the oil during the conditioning period shall not exceed 210 degrees Fahrenheit. The intensity of the vacuum or the temperature of the oil or both shall be adjusted so as to regulate the evaporation of the water satisfactorily. The conditioning shall continue until the material is sufficiently heated and enough water removed to permit proper penetration. The oil shall be removed from the cylinder before an empty-cell process is applied.

Preparation of Wood for Treatment

Par. 6272. *Sorting:* Whenever it is practicable the material shall be sorted into one kind or designated group of kinds of wood and into pieces of approximately equal size and moisture and sapwood content, and so separated as to insure contact of the heating medium with all surfaces.

Framing: So far as practicable, all adzing, boring, chamfering, framing, gaining, mortising, surfacing and similar framing, shall be done prior to treatment.

Incising: All Douglas Fir lumber and timber 3 inches and more in thickness shall be incised. Incising shall be performed in such a manner as to obtain a uniform depth of penetration of preservative with a minimum loss of structural strength.

Plant Equipment

Par. 6273. Treating plants shall be equipped with the thermometers and gauges necessary to indicate and record accurately the conditions at all stages of treatment, and all equipment shall be maintained in a condition satisfactory to the Buildings Engineer. The apparatus and chemicals necessary for making the analyses and tests required shall also be provided by plant operators, and kept in condition for use at all times.

Manner of Treatment

Par. 6274. Following the conditioning period, the material shall be treated by an empty-cell process whenever practicable, in order to obtain as deep and uniform penetration as possible with the retention of preservative stipulated. The material shall be treated by the full-cell process only when the maximum net retention is desired and where pressure is held to refusal, or when the stipulated retention is greater than can be obtained by the use of an empty-cell process. The ranges of pressure, temperature and time duration shall be controlled so as to get the maximum penetration by the quantity of preservative injected. There shall be no limitation of sapwood, nor requirement for heartwood, in any lumber, timber, or piling preservatively treated.

Retention and Penetration

Par. 6275. The retention and penetration for lumber, timber and piling of the various species shown shall be in accordance with the following:

Creosote or Creosote coal-tar solution treatments:

TABLE 6275T

Material	Minimum Net Retention per cubic foot of the Wood in Pounds
Southern yellow pine, Douglas fir, red oak, cypress, hemlock and black gum timber and lumber in general construction....	8
Southern yellow pine or cypress piles for land or fresh water use..............	12
Douglas fir or red oak piles for land or fresh water use......................	10
Southern yellow pine or cypress piles and timber in salt water subject to attack by marine borers....................	20
Douglas fir or red oak piles in salt water subject to attack by marine borers.....	14
Douglas fir and hemlock timber in salt water subject to attack by marine borers	12

Penetration:

Southern yellow pine, cypress, black gum, and red oak, lumber and timber. Penetration shall be at least two and one-half inches unless 90 per cent of the depth of the sapwood is penetrated.

Douglas fir and hemlock lumber and timber. Penetration in incised lumber up to 5 inches in thickness shall not be less than three-eighths inch and for lumber over 5 inches in thickness shall not be less than one-half inch. All incised lumber for marine structures shall have a penetration of not less than one-half inch. At least 90 per cent of the depth of sapwood shall be treated.

Southern yellow pine, cypress, and red oak piles. The penetration in any pile treated to a 12 pound retention shall not be less than 3 inches unless 90 per cent of the sapwood is penetrated. The penetration in any pile treated to a 20 pound retention shall not be less than 3.5 inches unless 90 per cent of the sapwood is penetrated.

Douglas Fir Piles. The penetration in any pile treated to a 10 pound retention shall not be less than three quarter inch. The penetration in any pile treated to a 14 pound retention shall not be less than seven-eighths inch.

The net retention in any charge shall be not less than 90 per cent of the quantity of preservative specified; but the average retention by the material treated under any contract or order and the average retention of any five consecutive charges shall be at least 100 per cent of the quantity specified.

Material of other species may be used subject to approval by the Buildings Engineer. Treatment shall be governed by the general clauses given herein, the sections of which to be used with details regarding retention and penetration shall be as prescribed by the Buildings Engineer.

Pressure Treatment Processes

Par. 6276. The following pressure processes shall be used for the treatment of timber, lumber and piles of the species shown, and for other species the treatment shall be governed by the general clauses given herein; the process to be used and the retention and penetration to be obtained shall meet the approval of the Buildings Engineer:

Empty-Cell—Rueping: The Material shall be subjected to an initial air pressure of the necessary intensity and duration. The preservative shall be introduced until the cylinder is filled, the air pressure being maintained constant during the filling operation. The pressure shall be raised to not more than 200 pounds per square inch for Southern yellow pine, red and white oak and black gum, and to not more than 150 pounds per square inch for Douglas fir, cypress and hemlock. The material shall be held under pressure until there is obtained the largest practicable volumetric injection that can be reduced to the stipulated retention by ejection of surplus preservative from expansion of the air initially introduced and by a quick high vacuum.

The temperature of the preservative during the entire pressure period shall be not more than 210 degrees Fahrenheit, but shall average at least 180 degrees Fahrenheit.

After pressure is completed the cylinder shall be emptied speedily of preservative, and a vacuum of not less than 22 inches at sea level created promptly and maintained until the wood can be removed from the cylinder free of dripping preservative.

Lowry: The preservative shall be introduced until the cylinder is filled, the atmospheric pressure being maintained during the filling operation. The pressure shall be raised to not more than 200 pounds per square inch for Southern yellow pine, red and white oak and black gum, and to not more than 150 pounds per square inch for Douglas fir, cypress and hemlock. The material shall be held under pressure until there is obtained the largest practicable volumetric injection that can be reduced to the stipulated retention by ejection of surplus preservative from expansion of the air and by a quick high vacuum.

The temperature of the preservative during the entire pressure period shall be not more than 210 degrees Fahrenheit, but shall average at least 180 degrees Fahrenheit.

After pressure is completed, the cylinder shall be emptied speedily of preservative and a vacuum of not less than 22 inches at sea level created promptly and maintained until the wood can be removed from the cylinder free of dripping preservative.

Full-Cell—Bethel: The material shall be subjected to a vacuum of not less than 22 inches at sea level for not less than 30 minutes. The preservative shall be introduced until the cylinder is filled without first breaking the vacuum. The pressure shall be raised to not more than 200 pounds per square inch for Southern yellow pine, red and white oak and black gum, and to not more than 150 pounds per square inch for Douglas fir, cypress and hemlock. The material shall be held under pressure until there is obtained the volumetric injection that will insure the stipulated retention, or until the wood is treated to refusal.

The temperature of the preservative during the entire pressure period shall be not more than 210 degrees Fahrenheit, but shall average at least 180 degrees Fahrenheit.

After pressure is completed the cylinder shall be emptied speedily of preservative and a vacuum of not less than 22 inches at sea level created promptly and maintained until the wood can be removed from the cylinder free of dripping preservative.

Protection of Field Cuts in Treated Materials

Par. 6277. All areas of preservatively treated lumber, timber or piles, which are cut, dapped or bored after treatment, where such cutting is necessary in the field, shall be promptly protected with at least two brush coats of the same preservative used in treating the material. In the case of creosoted materials, the creosote oil shall be applied hot (at least 150 degrees Fahrenheit). The heads of creosoted wood piles shall be further protected by a coating of roofing pitch, and where the pile heads are not completely encased in concrete, the heads shall be then covered with a neat cover of tarred roofing felt or rust-resistant metal, folded down over the sides of the piles, and firmly secured thereto with large roofing nails, to shed water.

Inspection of Treated Wood

Par. 6278. No lumber, timber or piling required to be preservatively treated in accordance with this section shall be permitted to be used unless each piece of such lumber, timber or piling is certified to and identified by a responsible inspection company approved by the Buildings Engineer as having been so treated.

SECTION 628

PLYWOOD

Scope of Plywood

Par. 6280. Plywood shall include glued built-up boards of laminated veneers of which the grain of each piece is at right angles to the grain of the adjacent pieces.

Classification of Plywood

Par. 6281. Plywood shall be classified as "Exterior Plywood", as "General Construction Plywood" and as "Interior Plywood".

Use of Plywood

Par. 6282. Plywood used for permanent exterior work shall be "Exterior Plywood".

Plywood used for permanent general construction work not exposed to the weather or for temporary exterior work shall be either "General Construction Plywood" or "Exterior Plywood".

Plywood used for paneling or other interior uses in heated buildings shall be "Interior Plywood", "General Construction Plywood" or "Exterior Plywood".

Plywood Standards

Par. 6283. "Exterior Plywood" shall conform to the provisions of "Exterior Plywood" given in Commercial Standards CS45-38 issued by the National Bureau of Standards for Douglas Fir Plywood or equivalent standards for other species.

"General Construction Plywood" shall conform to the provisions for "Moisture Resistant Plywood" given in Commercial Standards CS45-38 issued by the National Bureau of Standards for Douglas Fir Plywood or to equivalent standards for other species.

"Interior Plywood" shall be well manufactured but no standard for the moisture resistance of the glue is required.

Identification of the class of each piece of plywood by means of an official grade mark of plywood manufacturers associations conforming to Commercial Standards CS45-38 or its equivalent and under whose rules the species of plywood is graded, or identification by an official certificate of inspection of such association, shall be accepted as evidence that the standards are met and, when so identified, tests shall not ordinarily be required. When not so identified or when question arises concerning the authenticity of the class marking or certificate, the Buildings Engineer may require that tests be made in conformance with Commercial Standards CS45-38 or its equivalent.

Nailing Plywood

Par. 6284. Plywood shall be nailed securely three-eighths of an inch from the edge, not less than 6 inches on centers at all edges, and not less than 12 inches on centers for all intermediate studs, joists and headers with not less than 4d finish nails for interior use, 6d common nails for sheathing and 8d common nails for subfloor.

CHAPTER 63

METAL CONSTRUCTION

Sec. 630—General Requirements for Mental Construction.
Sec. 631—Metal Materials.
Sec. 632—Allowable Stresses for Metal Construction.
Sec. 633—Design of Beams, Girders and Trusses.
Sec. 634—Design of Tension and Compression Members.
Sec. 635—Riveting and Bolting.
Sec. 636—Welding.
Sec. 637—Steel Joists.
Sec. 638—Fabrication and Erection of Metal Structures.
Sec. 639—Steel Decks and Other Metal Floors.

SECTION 630

GENERAL REQUIREMENTS FOR METAL CONSTRUCTION

Scope of Metal Construction

Par. 6300. This Chapter defines the limits governing the design, fabrication and erection of structural metal for buildings and other structures, except as otherwise specifically defined in other parts of this Code.

Symbols and Notations for the Design of Metal Construction

Par. 6301. Unless otherwise given in the Paragraphs where they occur, the symbols and notations used in the design of metal construction are as follows:

b—width of flange in inches.
l—the unsupported length of column or beam in inches.
r—the least radius of gyration, in inches.
t—thickness of the web in inches.

Combined Axial and Bending Stresses

Par. 6302. Members subject to both axial and bending stresses shall be so proportioned that the quantity $\frac{f_a}{F_a} + \frac{f_b}{F_b}$ shall not exceed unity, in which:

F_a—allowable axial stress.
f_a —actual axial stress.
F_b—allowable bending stress.
f_b —actual bending stress.

Reversal of Stress

Par. 6303. Members subject to live loads producing alternating tensile and compressive stresses shall be proportioned as follows:

To both compressive and tensile stresses, add 50 percent of the smaller of the two stresses and proportion the member to resist either of the increased stresses resulting therefrom.

Connections shall be proportioned to resist the larger of the two increased stresses.

Minimum Thickness of Steel

Par. 6304. The thickness of steel in structural members, except linings, fillers, the edges of flanges and the webs of rolled beams and channels, shall be not less than one-quarter inch where protected from moisture and from the weather, and five-sixteenths inch where exposed to moisture or the weather, except that the thickness of steel in fire escapes and the structural members of roof signs, projecting signs, marquees and similar structures shall be not less than one-quarter inch. These regulations do not apply to steel joists, stairs, signs, skylights, structural members formed of sheet steel, cornice brackets, ventilator hoods, suspended ceilings and other light miscellaneous steel work, nor to Type F, Metal, buildings less than 3 stories or 30 feet in height, and 200,000 cubic feet or less in volume. However, all steel less than three-sixteenths inch thick shall be galvanized or protected by other approved coating, unless it is stainless steel or other corrosion resisting steel.

Provisions shall be made for parts subject to corrosive agents either by increasing the thickness of the metal or by effective protection.

Net Section of Metal Members

Par. 6305. In computing net area the diameter of a rivet hole shall be taken as one-eighth inch greater than the nominal diameter of the rivet.

In the case of a chain of holes extending across a part in any diagonal or zigzag line, the net width of the part shall be obtained by deducting from the gross width the sum of the diameters of all the holes in the chain and adding, for each gage space in the chain, the quantity $\frac{p^2}{4g}$ in which p is the longitudinal spacing or pitch and g is the transverse spacing or gage of two successive holes.

The critical net section of the part is obtained from that chain which gives the least net width. The gross width of angles shall be the sum of widths of the legs less the thickness. The gage for holes in opposite legs shall be the sum of gages from the back of angles less the thickness.

The cross-sectional area of splice members shall not be considered greater than that which has been developed by rivets or welds beyond the section considered.

Design of Connections for Metal Members

Par. 6306. The end reaction stresses of beams, girders and trusses and the axial stresses of tension and compression members shall be fully developed at the connections of such members by bolts, rivets or welds, except that where reversal of stress is not possible and the joint is supported laterally, the ends of compression members may be milled to plane parallel surfaces and abutted, with sufficient splicing to hold the connected members accurately and firmly in place and in bearing.

Members meeting at a joint shall have their gravity axes meet at a point if practicable; and if not, provision shall be made for the effect of the resulting eccentricity.

A group of rivets or welds transmitting stress to a member should preferably have its center of gravity in the line of stress; otherwise, provision shall be made for the effect of the resulting eccentricity.

When a beam or girder is connected by a connection more rigid than a standard web connection to a supporting member in such a way that it acts as continuous or fixed at the end, proper provision shall be made for the bending at the connection.

Stresses carried on rivets shall be developed by shearing and bearing values of the rivets but where rivets are used for shelf or bracket supports or for connections that also provide rigidity to the structure, the rivets may, in addition to their shearing and bearing stresses, carry tension. In proportioning rivets, the nominal diameter of the rivet shall be used.

When stress is transmitted from one member to another by rivets through a filler, the filler shall be extended beyond the connected member and the extension secured by a sufficient number of rivets to develop the strength of the filler.

Riveted connections carrying calculated stresses, except for lacing, sag bars, hand rails and girts, shall have not less than two rivets.

Shop and Field Connections for Metal Members

Par. 6307. Riveting or welding shall be used for all shop connections and for the following field connections:

Column splices in all tier structures 200 feet or more in height.

Column splices in tier structures 100 to 200 feet in height, if the least horizontal dimension is less than 40 per cent of the height.

Column splices in tier structures less than 100 feet in height, if the least horizontal dimension is less than 25 per cent of the height.

Connections of all beams and girders to columns, and of any other beams and girders on which the bracing of columns is dependent, in structures over 125 feet in height.

Roof-truss splices and connections of trusses to columns, column splices, column bracing, and crane supports, in all structures carrying cranes of over 5-ton capacity.

Connections for supports of running machinery or of other live loads which produce impact or reversal.

Any other connections stipulated on the design drawings.

Bracing Metal Structures

Par. 6308. For all buildings, other structures or parts thereof, except those having masonry walls and a height not exceeding four times the least horizontal dimension, special attention shall be given to the connections of the structural frame to secure rigidity.

Trusses shall be braced in pairs by bracing in the planes of the top and bottom chords unless rigidly braced by other means. Such braced pairs shall have transverse bracing between the trusses when their span exceeds 35 feet, unless rigidly braced by other means. Transverse bracing shall be placed not more than 30 feet apart nor more than 30 feet from the truss supports. The braced pairs of trusses shall be connected to each other and to the intervening trusses by bracing in the plane of the bottom chord in line with the lower chord of the transverse bracing, or the struts of the bottom chord bracing. If the trusses have a span of 30 feet or less, not more than 4 unbraced bays shall intervene between the braced bays, and if the span exceeds 30 feet, not more than 3 unbraced bays shall intervene. When the trusses rest on columns, the columns supporting the braced bays shall also be braced. All trusses shall be braced at the peak by struts, and if supported on columns, they shall also have eave struts. Bracing can be used as determinate structures or rigid frame structures.

For structures carrying cranes, running machinery, or other live loads which produce impact or reversal, all bracing shall be rigid.

Towers shall be provided with horizontal portal or diagonal bracing.

Purlins, girts and similar members shall be provided with sufficient sag rods to hold them in their proper positions.

Expansion Joints in Metal Structures

Par. 6309. Proper provisions for expansion and contraction, meeting the approval of the Buildings Engineer, shall be made in all steel buildings and other structures. Expansion joints not more than 200 feet apart shall be provided in all steel buildings more than 400 feet long and not more than 100 feet apart in all steel trestles and other similarly exposed structures more than 200 feet long. When the ends of such buildings, trestles and structures are not free to move, expansion joints shall be provided at a distance of not more than 200 feet and 100 feet, respectively, from a restrained end.

The allowance for expansion of buildings shall not be less than one-half inch per 100 feet and of trestles and other similarly exposed structures, one inch per 100 feet.

SECTION 631

METAL MATERIALS

Structural Steel

Par. 6310. Structural steel shall conform to the "Standard Specifications for Steel for Bridges and Buildings" of the American Society for Testing Materials, Serial Designation A7-39.

Copper bearing structural steel shall contain not less than 0.20 per cent of copper.

Rivet Steel and Bolt Steel

Par. 6311. Rivet steel shall conform to the "Standard Specification for Structural Rivet Steel" of the American Society for Testing Materials, Serial Designation A141-38.

Bolt Steel shall conform to the "Standard Specifications for Steel for Bridges and Buildings" of the American Society for Testing Materials, Serial Designation A7-39.

Alloy Steels

Par. 6312. Silicon steel shall conform to the "Standard Specifications for Structural Silicon Steel" of the American Society for Testing Materials, Serial Designation A94-36.

Nickel steel shall conform to the "Standard Specifications for Structural Nickel Steel" of the American Society for Testing Materials, Serial Designation A8-38.

Cast Steel

Par. 6313. Cast steel shall conform to Grade B1 of the "Standard Specifications for Carbon-Steel Castings for Miscellaneous Industrial Uses" of the American Society for Testing Materials, Serial Designation A27-39.

Cast Iron

Par. 6314. Cast iron shall conform to Class 25 of the "Standard Specifications for Gray-Iron Castings" of the American Society for Testing Materials, Serial Designation A48-36.

Aluminum

Par. 6315. Aluminum for bars, rods and shapes shall conform to the "Tentative Specifications for Aluminum Alloy (Duralumin) Bars, Rods and Shapes" of the American Society for Testing Materials, Serial Designation B89-39T.

Aluminum for sheets and plates shall conform to the "Tentative Specifications for Aluminum Alloy (Duralumin) Sheet and Plate" of the American Society for Testing Materials, Serial Designation B78-39T.

Stock Material

Par. 6316. Stock material shall conform to the specifications of the American Society for Testing Materials for new materials that would be used for the intended purpose.

Second-Hand Material

Par. 6317. Second-hand material and unidentified stock, if free from twists, bends and surface imperfections, may be used with the approval of the Buildings Engineer for structural members, but the allowable stresses for rolled sections shall not exceed 75 per cent of those permitted for new structural steel in Section 632, and for cast sections they shall not exceed 50 per cent of those permitted for new cast iron in Paragraph 6327, or for new cast steel in Paragraph 6326, whichever applies.

Arc-Welding Electrodes and Gas-Welding Rods

Par. 6318. Arc-welding electrodes and gas-welding rods used for structural steel shall produce welds with an ultimate tensile strength of not less than 60,000 pounds per square inch. The elongation in 2 inches of the welds shall be not less than 15 per cent for ordinary structures nor less than 25 per cent for structures subject to impact. The free bend elongation shall be not less than 25 per cent.

All arc-welding electrodes shall be coated or covered except those used in welding machines for shop welding of tanks and similar work not subject to high stresses.

The physical tests of the filler metal including the bend test shall be performed in accordance with the "Tentative Specifications for Iron and Steel Filler Metal" of the American Society for Testing Materials, Serial Designation A205-37T. Test welds of filler metals for structures shall not be stress-relieved.

Other Structural Metals

Par. 6319. Other structural metals shall conform to the applicable specifications of the American Society for Testing Materials.

SECTION 632

ALLOWABLE STRESSES FOR METAL CONSTRUCTION

Allowable Tensile Stresses for Steel

Par. 6321. The tensile stresses in pounds per square inch on the net section of rolled steel shall not exceed the following values:

Structural Steel	20,000
Silicon Steel	24,000
Nickel Steel	25,500

The tensile stresses on the area of the nominal diameter of rivets or the net area of bolts shall not exceed 15,000 pounds per square inch.

Allowable Bending Stresses for Steel

Par. 6322. The bending stresses, in pounds per inch, for rolled steel beams and plate girders, shall not exceed the following values:

TABLE 6322T

Stress	Kind of Steel		
	Structural	Silicon	Nickel
Tension.........	20,000	24,000	25,000
Compression: but not to exceed the value obtained when $\frac{l}{b}$ equals 15	$\frac{22{,}500}{1+\frac{l^2}{1{,}800b^2}}$	$\frac{28{,}000}{1+\frac{l^2}{1{,}480b^2}}$	$\frac{30{,}000}{1+\frac{l^2}{1{,}350b^2}}$

Allowable Compressive Stresses for Steel

Par. 6323. The compressive stresses, in pounds per square inch, for rolled steel shall not exceed the following values:

TABLE 6323T

	Kind of Steel		
	Structural	Silicon	Nickel
For axially loaded columns with values of $\frac{l}{r}$ not greater than 120.	$17{,}000-0.485\frac{l^2}{r^2}$	$20{,}000-0.705\frac{l^2}{r^2}$	$22{,}000-0.8332\frac{l^2}{r^2}$
For axially loaded columns with values of $\frac{l}{r}$ greater than 120.	$\frac{18{,}000}{1+\frac{l^2}{18{,}000r^2}}$	$\frac{18{,}000}{1+\frac{l^2}{18{,}000r^2}}$	$\frac{18{,}000}{1+\frac{l^2}{18{,}000r^2}}$
For plate girder stiffeners, compression splice members and other members in which lateral deflection is prevented.........	20,000	24,000	25,500
Webs of rolled sections at toe of fillet. See paragraph 6333.....	24,000	28,000	30,000

Allowable Shearing Stresses for Steel

Par. 6324. The shearing stresses, in pounds per square inch, for rolled steel shall not exceed the following values:

TABLE 6324T

	Kind of Steel			
	Structural	Silicon	Nickel	Rivet, Bolt
Pins	15,000	18,000	20,000	. . . . . .
Gross area of webs of beams and girders.	13,000	14,000	16,000	. . . . . .
Power-driven rivets, turned bolts and rivet bolts	. . . . . .	. . . . . .	. . . . . .	15,000
Unfinished bolts and hand-driven rivets .	. . . . . .	. . . . . .	. . . . . .	10,000

Allowable Bearing Stresses for Steel

Par. 6325. The bearing stresses in pounds per square inch, except for rollers, for rolled steel shall not exceed the following values:

TABLE 6325T

	Kind of Steel			
	Structural	Silicon	Nickel	Rivet, Bolt
Pins, assuming contacting plates are of same material as pins	32,000	38.000	42,000	. . . . . .
Bearing of milled stiffeners and other milled parts of the same material in contact	30.000	36,000	40,000	. . . . . .
Expansion rollers, in pounds per linear inch, assuming the contact plates are of the same material as the rollers, in which D is the diameter of the roller in inches. . . .	600D	800D	800D	. . . . . .
Power-driven rivets, rivet bolts, turned bolts in reamed holes:				
Single shear	. . . . . .	. . . . . .	. . . . . .	32,000
Double shear . . .	. . . . . .	. . . . . .	. . . . . .	40,000
Unfinished bolts and hand-driven rivets:				
Single shear	. . . . . .	. . . . . .	. . . . . .	20,000
Double shear . . .	. . . . . .	. . . . . .	. . . . . .	25,000

Allowable Stresses for Cast Steel

Par. 6326. The compression and bearing stresses for cast steel shall be the same as those specified for structural steel. Other stresses shall not exceed 80 per cent of those specified for structural steel.

Allowable Stresses for Cast Iron

Par. 6327. The stresses in pounds per square inch for cast iron shall not exceed the following values:

Tension	3,000
Compression	10,000
Shear	3,000
Bending:	
In compression flange	10,000
In tension flange	3,000
Compression in axially loaded columns	$9{,}000 - 40\frac{l}{r}$

In no case shall the ratio of $\frac{l}{r}$ exceed 70.

Allowable Stresses for Aluminum Alloys

Par. 6328. The stresses in pounds per square inch in rolled members of aluminum alloys shall not exceed the following values:

TABLE 6328T1

Alloy and Temper	Bending and Tension	Compression	Bearing	Shear
3S½H	5,000	6,000	7,000	3,500
3SH	6,500	8,000	10,000	4,000
17ST	12,000	15,000	19,000	9,000
25SW	10,000	12,000	16,000	7,500
25ST	12,000	15,000	19,000	9,000
51SW	7,200	9,000	11,000	6,000
51ST	11,000	14,000	16,000	7,500

The allowable compressive stresses for aluminum columns shall be computed from the following formula:

$$f_c = B - K\frac{l}{r}$$

The slenderness ratio of a colum, $\frac{l}{r}$, shall not exceed the value of C.

The values of B, C and K shall be taken from the following table:

TABLE 6328T2

Alloy & Temper	3S½H	3SH	17ST 25ST	25SW	51SW	51ST
B	6,000	8,000	15,000	12,000	9,000	14,000
C	128	111	81	91	105	84
K	31	48	123	88	57	111

Allowable Stresses for Welds

Par. 6329. The stresses in pounds per square inch for welds on structural steel work shall not exceed the following values:

Fusion Welds, through the throat:

Shear	13,600
Tension	16,000
Compression	Same as base metal

Pressure Welds: The stresses in pounds per square inch for pressure welds, except spot welds, shall not exceed 11,300 in shear nor 13,000 in tension.

Spot Welds: The stresses per square inch for spot welds shall not exceed 11,300 pounds. In computing the stresses, the area used shall be the lesser value of either the actual area of the weld or the product of the thickness of the thinnest piece of metal being welded multiplied by the perimeter of the weld.

The fiber stresses due to bending shall not exceed the values prescribed for tension or compression respectively. The combined shear in a weld due to torque and direct load shall not exceed the allowable shearing stress.

All welds on other than structural steel work shall be designed with a factor of safety of not less than four, based upon tests specified in Paragraph 6318.

SECTION 633

DESIGN OF BEAMS, GIRDERS AND TRUSSES

Effective Span Length

Par. 6330. Beams, girders and trusses shall ordinarily be designed on the basis of simple spans whose effective length shall be taken as the distance center to center of their bearings. If they are connected to the face of a flange or web of a column, the span shall be taken to such face.

When designed on the assumption of end restraint, full or partial, based on continuous or cantilever action, beams, girders and trusses, as well as the members to which they connect, shall be designed to provide for the shears and moments so introduced.

Proportioning Plate Girders and Rolled Beams

Par. 6331. Plate girders, cover-plated beams and rolled beams shall in general be proportioned by the moment of inertia of the gross section. No deductions are required for standard shop or field rivet holes in either flange, except that in special cases where the reduction of the area of either flange by such rivet holes exceeds 15 per cent of the gross flange area, the excess shall be deducted. If such members contain other holes, as for bolts, pins or countersunk rivets, the full deduction for such holes shall be made. The deductions thus applicable to either flange shall be made also for the opposite flange if the corresponding holes are there present.

Webs and Flanges of Plate Girders

Par. 6332. Plate girder webs shall have a thickness of not less than one one-hundred-seventieth of the clear distance between the flanges for structural steel and one one-hundred-forty-fifth of such distance for silicon and nickel steel.

Web splices shall be proportioned to transmit the full shearing and bending stresses in the web at the section spliced. Where splice plates are used at least one plate shall be placed on each side of the web.

Flange plates shall be equal in thickness or shall diminish in thickness from the flange angles outward. No plate shall be thicker than the flange angles.

The total cross sectional area of flange plates shall not exceed 70 per cent of the total flange area of riveted girders. Flange plates shall extend at least one foot beyond the theoretical end and there shall be a sufficient number of rivets at each end of each plate to develop its full stress value before the end of the next outside plate is reached.

Flange splices shall be proportioned to develop the full stress of the members cut.

Rivets connecting the flange to the web of plate girders shall be proportioned to resist the horizontal shear due to bending as well as any loads applied directly to the flange.

Web Crippling of Rolled Beams

Par. 6333. Rolled beams shall be so proportioned that the compressive stress, as determined by the following formulas, at the tangent of the fillet and the web resulting from concentrated loads shall not exceed the values given in Paragraph 6323.

For interior load or reactions $f_c=\dfrac{R}{t(N+2k)}$

For end loads or reactions $f_c=\dfrac{R}{t(N+k)}$

in which:

f_c—allowable compressive stress in pounds per square inch.
R—concentrated load or reaction in pounds.
N—length of bearing in inches.
k—distance from outer face of the flange to the tangent of the fillet at the web, in inches.
t—thickness of web in inches.

Web Stiffeners for Beams and Girders

Par. 6334. Stiffeners shall be provided on both sides of the web of plate girders, over bearings and at points of concentrated loads, designed to transmit the reactions and loads to the web. Such stiffeners shall be fitted to the flange angles where they bear and shall not be crimped. Only that portion of the outstanding legs of stiffeners outside of the fillets of the flange angle shall be considered effective in bearing.

Fitted stiffeners shall also be provided on the webs of rolled beams and channels where necessary to transmit to the web the reactions or concentrated loads.

Fillers under stiffeners over bearings and at points of concentrated load shall be secured by a sufficient number of rivets to prevent excessive bending and bearing stresses.

Intermediate stiffeners shall be provided on both sides of the webs of plate girders at all sections where $\dfrac{h}{t}$ exceeds $\dfrac{8000}{\sqrt{v}}$ for structural steel, $\dfrac{7100}{\sqrt{v}}$ for silicon steel, and $\dfrac{7600}{\sqrt{v}}$ for nickel steel, in which v is the shearing stress on the gross area of the web, in pounds per square inch.

The clear d spacing of such stiffeners on girders of structural or alloy steel shall not exceed 6 feet nor the distance given by the following formula:

$$d=\frac{270{,}000t}{v}\sqrt[3]{\frac{vt}{h}}$$

in which h is the clear height of the web in inches between the flanges and t is the thickness of the web in inches.

Intermediate stiffeners shall overlap but need not bear on the flange angles.

The outstanding leg of a stiffener angle or the width of a flat bar serving as a stiffener on welded girders shall not exceed 16 times its thickness and shall extend as closely as possible to the outer toe of the flange angle or the edge of the flange plate where no flange angle is used.

Unsupported Compression Flanges

Par. 6335. The unsupported length between positive lateral supports of the compression flange of beams and girders shall not exceed 40b. All lateral supports, except as hereinafter permitted, shall be struts.

The compression flange of beams not more than 24 inches in depth, with a length of not more than 40b between struts providing lateral supports, may be considered laterally supported between such struts by the following methods:

1. Tie rods connecting not more than 5 beams. Such rods shall be at least three-quarters of an inch in diameter for beams less than 12 inches in depth and at least seven-eights of an inch for beams 12 to 24 inches in depth.
2. Joists or slabs bearing on the full width of the flange.
3. Steel or other type deck roofs or floors properly clipped to flanges of supporting members.
4. Beams encased in masonry walls. The thickness of the wall may be used for the flange width in determining the 1/b.

The compression flange of beams more than 24 inches in depth may be considered laterally supported by joists or slabs anchored to the flange so as to laterally stay it in both directions. Such joists shall be riveted, bolted or welded to the flange or the flange shall be imbedded in the slabs or otherwise anchored to them.

All struts and tie rods shall be properly anchored to a braced bay or substantial wall. Joists considered as lateral support shall be braced by continuous slabs or planking or otherwise.

Standard diaphragm separators, joining two members in bending, or steel pipe separators with concrete filling, shall be considered effective lateral support to each of the members.

Design of Trusses

Par. 6336. Where the top chord of a truss supports wood or steel purlins, these purlins shall be fastened to the truss by bolting, riveting or welding and the top chord of the truss may then be assumed as being stayed at the points where the purlins are fastened.

Where purlins rest on the top chord of a truss between panel points, the top chord shall be proportioned for the combined bending and axial stresses in accordance with Paragraph 6302 and may be assumed to be a continuous member.

Gusset plates for trusses with end reactions greater than 35,000 pounds shall be not less than three-eights inch thick.

Grillages

Par. 6337. Grillage beams shall be provided with separators spaced not over 6 feet on centers. The separators shall be either diaphragms or pipes, except that pipes shall not be permitted for beams more than 10 inches in height, if the beams are without concrete encasement.

There shall be at least two pipe separators arranged in a vertical plane, or two bolts connecting a diaphragm, at each required point, for beams 12 inches to 27 inches in height and three such separators or bolts for beams over 27 inches in height. The pipe shall be not less than one inch in diameter.

Beams, Girders and Trusses Supported on Masonry

Par. 6338. When any lintel, beam, girder or truss is supported at either end by a wall or pier, such lintel, beam, girder or truss shall extend into the masonry at least 6 inches and shall be properly anchored therein to prevent lateral movement and shall rest upon a bearing plate or shoe of metal or stone of such design and dimensions as to safely distribute its load on the masonry, except that when beams not exceeding six inches in depth are placed not more than 30 inches on centers, bearing plates shall be unnecessary.

Beams, girders and trusses with spans exceeding 50 feet shall be supported on especially designed masonry, or on columns of steel or reinforced concrete.

Torsional Stresses in Beams

Par. 6339. The torsional stresses in beams of H- and I- sections shall be taken not less than the values given by the following formulas:

$$s_w = \frac{T(t+0.3r_f)}{K}$$

$$s_f = \frac{T(m+0.3r_f)}{K}$$

$$K = 0.4dt^3 + 0.1(m+n)^3(b-t)$$

at the center of the span

for a uniformly distributed load

$$f_t = T.\frac{ab}{gI_y}\left[\tanh\frac{L}{2a} - \frac{2a}{L}\left(1 - \frac{1}{\cosh\frac{L}{2a}}\right)\right]$$

for a concentrated load at center of span

$$f_t = T.\frac{ab}{gI_y}.\tanh\frac{L}{2a}$$

in which

$$a = .806g\sqrt{\frac{I_y}{K}}$$

The sum of the maximum unit shears due to vertical load and to torsion shall not exceed the values specified in Paragraph 6324 and the sum of the unit fiber stresses at a section due to vertical bending and to torsional bending shall not exceed the values specified in Paragraph 6322.

These formulas are for simple spans only, with fully unrestrained ends, and for but two conditions of loading, that is:

1. A load uniformly distributed over the full length of the span, applied with constant eccentricity throughout.
2. A single load concentrated at the center of the span, eccentrically applied.

For the purpose of this regulation, riveted and welded end connections, and ends embedded in masonry, may be considered as fully unrestrained ends, and the restraining action of filler beams, tie rods, concrete floors and similar members shall be neglected.

For beams with end restraint, i. e. where the flanges are restrained from warping longitudinally relative to each other, and with span and loading conditions and sections other than those specifically regulated herein, torsional stresses shall also be taken into consideration.

The symbols and notations used in the formulas are as follows:

b—width of flange, in inches.
cosh—hyperbolic cosine.
d—depth of beam, in inches.
f_t—flange stress, in pounds per square inch.
g—distance between flange centroids, in inches.
I_y—moment of inertia of the beam about the web axis (Y-Y) in inches.^{4}
K—torsional stiffness factor, in inches.^{4}
L—length of span, in inches.
m—maximum thickness of the flange, in inches.
n—minimum thickness of the flange, in inches.

r_f—radius of fillet, at junction of web and flange, in inches.
s_w—maximum unit shearing stress in the web due to torsion, in pounds per square inch.
s_f—maximum unit shearing stress in the flange due to torsion, in pounds per square inch.
T—torsional moment, in inch-pounds, equal to one-half of the total moment of the eccentric load.
t—thickness of web, in inches.
tanh—hyperbolic tangent.

SECTION 634

DESIGN OF TENSION AND COMPRESSION MEMBERS

Proportioning Tension and Compression Members

Par. 6340. Unless otherwise specified, tension members shall be designed on the basis of net section and compression members, on the basis of gross section.

Slenderness Ratio

Par. 6341. The ratio of unbraced length to least radius of gyration, $\frac{l}{r}$, for compression members shall not exceed:

For main members	120
For secondary members, and members supporting construction loads	200

Main compression members are columns, compression members of trusses and similar members. Secondary members are such members as knee braces, wind bracing, struts and similar members.

Webs and Cover Plates of Compression Members

Par. 6342. In compression members consisting of elements connected by cover plates, lacing or webs, the thickness of the webs of the elements shall not be less than one-thirty-second of the unsupported distance between the nearest rivet lines, or the tangents of the web and the fillets in case of rolled sections. The thickness of the cover plates or webs connecting the elements shall be not less than one-fortieth of the unsupported distance between the nearest lines of their connecting rivets, or the roots of their flanges in case of rolled sections.

Tie Plates

Par. 6343. Compression members provided with lacing shall have tie plates as near each end as practicable and at intermediate points where the lacing is interrupted. In main members the length of the end tie plates shall be not less than the distance between the lines of rivets or welds connecting them to the elements of the member and of the intermediate plates, not less than one-half this length.

Tie plates used to connect the elements of tension members shall have a length of not less than two-thirds of that specified for main compression members.

The thickness of tie plates shall be not less than one-fiftieth of the distance between the lines of rivets or welds connecting them to the elements of the member. Riveted plates shall have at least three rivets in each connection.

Lacing for Compression Members

Par. 6344. The opensides of compression members shall be provided with lacing bars so spaced that the ratio $\frac{l}{r}$ of the flange included between their connections shall be not over three-fourths of the maximum $\frac{l}{r}$ of the member as a whole.

Lacing bars shall be proportioned to resist a shearing stress normal to the axis of the member equal to two percent of the total compressive stress in the member. The shear shall be considered as divided equally among all shear-resisting elements in parallel planes, whether made up of continuous plates or of lacing. In determining the section required for the lacing bar the compression formula shall be used, l being taken as the length of the bar between the outside rivets or welds connecting it to the elements of the member for single lacing and 70 percent of that distance for double lacing. The ratio $\frac{l}{r}$ shall not exceed 140 for single lacing nor 200 for double lacing.

The thickness of lacing bars shall be not less than one-fortieth for single lacing, and one-sixtieth for double lacing, of the distance between end rivets or welds; their minimum width shall be three times the diameter of the rivets connecting them to the elements.

The inclination of lacing bars to the axis of the members shall preferably be not less than 45 degrees for double lacing and 60 degrees for single lacing. When the distance between the rivet or weld lines in the flanges is more than 15 inches, the lacing shall be double and riveted or welded at the intersection if bars are used, or else shall be made of angles.

Cast Iron Columns

Par. 6345. Cast iron columns shall not be used where the eccentricity of loadings, or the lateral forces, are such as to cause tension over any part of the column section. They shall not be used in garages nor in other structures where they may be subject to excessive impact.

The ends of cast iron columns shall be machined to a smooth plane surface perpendicular to the axis to provide full bearing for the entire cross section of the column.

Hollow cast iron columns, except when open at both ends and without flanges, shall have two three-eight inch holes drilled in the shell to exhibit the thickness thereof. Additional holes shall be drilled when required by the Buildings Engineer. If the core of a cast iron column is found to have shifted more than one-quarter the thickness of the shell, the strength shall be computed assuming the thickness all around to be that of the thinnest part. Wherever blow-holes or other imperfections are found which reduce the area of the cross-section more than ten percent, the column shall be condemned. Cast iron columns shall not be painted until after inspection and approval by the Buildings Engineer.

Cast iron columns shall not be smaller than 5 inches in outside diameter or side, and the thickness of metal shall not be less than one-twelfth the outside diameter or least side, nor less than one-quarter inch.

Cast iron columns shaped other than round shall not be approved without being tested.

Column Bases

Par. 6346. Proper provision shall be made to transfer the column loads, and moments if any, to the footings and foundations. Anchor bolts shall be of sufficient size to develop the computed stresses.

Column bases shall be set level and to correct elevation with full bearing on their supports.

Column bases shall be finished to accord with the following requirements:

1. Rolled steel bearing plates, if they do not have satisfactory contact bearing surfaces, shall be straightened or the bearing surfaces shall be planed, except as noted under 3.
2. Column bases other than rolled steel bearing plates shall be planed on all bearing surfaces, except as noted under 3.

3. The bottom surface of bearing plates and column bases which rest on masonry foundations and are grouted to insure full bearing contact need not be planed.

Cast iron bases shall have a thickness of metal of not less than one inch. The inclination of the outer ribs with the horizontal shall be not less than 45 degrees. Edges of bed plates more than 3 feet in length shall be reinforced with a flange not less than 3 inches high.

Pin Connected Tension Members

Par. 6347. Pin connected tension members shall have a net section through the pin hole transverse to the axis of the member of not less than 140 per cent and back of the pin hole, parallel to the axis of the member, of not less than 100 per cent of the net section of the body of the member. The net width transverse to the axis of the member shall not exceed 8 times the thickness of the member at the pin.

Adjustable Members

Par. 6348. The total initial tensile stress in any adjustable member shall be assumed as not less than 5000 pounds. The adjusting devices of such members shall be prevented from working loose by the burring of threads or by welding.

SECTION 635

RIVETING AND BOLTING

General Requirements for Riveting

Par. 6351. All rivets, where possible, shall be power-driven at bright red heat. Rivets driven by pneumatically or electrically operated hammers are considered power-driven. Rivets after driving shall be tight, completely filling the holes and with heads covering the shank of the rivet and in full contact with the gripped surfaces. Loose, burned, or otherwise defective rivets shall be replaced.

Turned Bolts and Rivet Bolts

Par. 6352. Turned bolts and rivet bolts shall be permitted in shop and field work as a substitute for rivets. The finished shank shall be long enough to provide full bearing, and washers shall be used under the nuts to give full grip when the nuts are turned tight.

Unfinished Bolts

Par. 6353. Unfinished bolts shall not be permitted in shop connections. They may be used for such field connections that are not required in Paragraph 6307 to be riveted or welded.

Rivets Subject to Shearing and Tensile Forces

Par. 6355. Rivets subject to shearing and tensile forces shall be so proportioned that the combined stress will not exceed the allowable stress for rivets in tension.

Rivet Grips

Par. 6356. Rivets carrying calculated stresses and having a grip that exceeds five diameters, shall have their number increased one per cent for each additional one-sixteenth inch in the grip.

Rivet Spacing

Par. 6357. The maximum distance between centers of rivets in the line of stress in compression members shall be 16 times the thickness of the thinnest outside plate or shape and 20 times the thickness of the thinnest enclosed plate or shape but in no case to exceed 12 inches. At right angles to the direction of stress the maximum distance between lines or rivets shall be 30 times the thickness of the thinnest plate or shape.

In built-up sections with angles having two gage lines the maximum distance between centers of rivets in the line of stress in each gage line shall be 24 times the thickness of the thinnest plate or shape, but never more than 18 inches.

The maximum distance from the center of rivets to any edge shall be 12 times the thickness of the thinnest plate or shape, but shall not exceed 6 inches.

The pitch of rivets at the end of built-up compression members shall not exceed 4 times the diameter of the rivet for a length equal to one and one-half times the maximum width of the member.

In compression members composed of two angles, a pitch of two feet will be allowed, but the ratio $\frac{l}{r}$ for each angle between rivets shall be not more than three-fourths of that for the whole member.

SECTION 636

WELDING

Scope and Classification of Welding

Par. 6360. Welding includes all processes utilizing heat by which the localized consolidation of metals is obtained.

The principal welding processes are classified as follows:

1. Fluid or fusion, in which metals are united by weld metal without the application of pressure. The source of heat is:
   a. The electric arc.
   b. The gas torch.
   c. A chemical reaction, *i. e.,* thermit, which serves also as the weld metal.
2. Plastic, in which metals are united by the application of pressure without weld metal. The source of heat is:
   a. The resistance to an electric current.
   b. The forge furnace.
   c. A chemical reaction, *i. e.,* thermit pressure.

Definitions for Welds

Par. 6361. *Base Metal* shall mean the parent material to be welded or cut.

Butt Weld shall mean a weld whose throat lies in a plane disposed approximately 90 degrees with respect to the surfaces of at least one of the parts joined.

Fillet Weld shall mean a weld of approximately triangular cross section whose throat lies in a plane inclined with respect to the surfaces joined.

Gas Cutting shall mean the process of severing ferrous metals by means of the chemical behavior of oxygen in the presence of ferrous metals at high temperatures.

Root shall mean the zone at the bottom of the cross-sectional space provided to contain a fusion weld.

Spot Weld shall mean a resistance weld made in one or more spots by the localization of electric current between contact poles.

Throat shall mean the minimum thickness of a weld along a straight line passing through a root.

Throat Dimension shall mean the thickness of a throat assumed for the purpose of the design. The throat dimension of a fillet weld is the altitude from the root to the opposite side of the largest isosceles triangle which can be constructed within the cross section of the weld, the equal legs lying in the fused faces. The throat dimension of a butt weld is the thickness of the thinnest part joined.

Weld Dimension shall mean the dimension of a weld expressed as the throat dimension by the weld length.

Weld Length shall mean the unbroken over-all length of the full cross section of the weld exclusive of the length of any craters.

General Requirements for Welding and Cutting

Par. 6362. All welding on metal structures shall be fusion welding, but the use of gas welding shall be limited to shop welds and to such field connections which are approved by the Buildings Engineer. However, these restrictions to the use of gas welding shall not be interpreted to apply to pipe and tank work.

Fusion welding of alloy steels and non-ferrous metals, where structural safety is concerned, shall be performed only by special permission of the Buildings Engineer and then only by welders holding special certificates for welding the specific type of metal to be connected.

Resistance welding shall be permitted for the shop fabrication of steel joists, stair stringers, sheet metal parts and other similar members. It shall also be permitted for attaching sheet metal work in the field.

On new structures, welds and rivets combined in one connection shall not be permitted to share stresses.

On existing structures, when approved by the Buildings Engineer, welds and rivets may share stresses in accordance with Paragraph 6005, if the welds do not carry more than 20 per cent of the total stress and if the stresses in the welds do not exceed 50 per cent of the allowable stresses.

Surfaces to be welded shall be free from rust, loose scales, dirt and paint.

No welding shall be permitted when the surrounding temperature is below 25 degrees Fahrenheit.

Gas or arc cutting shall not be permitted to replace milling or on any structural member while under stress, except that detail cutting to correct minor fabrication errors may be done if the removal of such metal does not reduce the strength below the design requirements. Cutting of structural members to form openings or to remove portion of flanges shall not be done unless provided for in the design of the member.

Butt Welds

Par. 6363. Butt welds shall be continuous and shall have the same theoretical section as the plate or member they connect. Butt welds shall be reinforced at least twelve and one-half percent of the throat dimension for double welds and at least twenty per cent for single welds, but such reinforcement need not be more than 1/8-inch thick, and on the finished weld it may be ground or chipped smoothly away. All butt welds shall have complete penetration.

Fillet Welds

Par. 6364. The stress in fillet welds shall be considered as if in shear for any direction of the applied stress. If single fillet welds are used, bending in the connection shall be fully developed.

The length of any fillet weld shall be equal to design length plus twice the size of the weld, but in no case shall the length be less than four times the weld size.

Resistance Welds

Par. 6365. Resistance welded members, which fail to provide a factor of safety of at least four in respect to the design load, shall be rejected.

Testing of resistance welded joints to destruction shall be made at least once each shift during their manufacture, every time the combination of material to be welded is changed, every time the machine is readjusted, when operators are changed, and when requested by the Buildings Engineer. Destructive tests in which the welded joint fails outside of the weld shall be accepted as showing that the weld is satisfactory, in which case that fact shall be recorded rather than the actual load.

Welded Connections

Par. 6366. Welded joints shall be so designed and welded that the stresses in the welds shall not exceed the values specified in Paragraph 6329, and warping and internal stresses may be kept under control and at a safe minimum. In designing welded joints provision shall be made for bending stresses due to eccentricity, if any, in the disposition or section of the base metal. Unless the moment at a connection is fully developed, bolts shall be provided and left in place to prevent tearing at the end of the welds, where the form of the connection is such that a progressive tearing may be expected.

Direct web welds may be used provided the weld length does not exceed 2/3 the beam depth and the effective weld size is not less than 4/5 of the web thickness.

Plates and welds shall be so shaped as to transfer gradually the stresses from one member to another.

Welded Structural Members

Par. 6367. In welded girders, the connection of component parts of flanges to each other and of flanges and stiffeners to webs shall be by continuous or intermittent fillet or butt welds designed to transmit the stress. Welded girders carrying loads which produce impact, vibration or reversal of stresses shall have the flanges and web connected by continuous welds.

In welded compression members, the connection of component parts may be either continuous or intermittent welds. If intermittent, the length of each weld at the ends of the member shall equal the width of the member. Fillet welds, except on lattice members, shall be spaced in the clear not more than 12 inches nor more than 16 times the thickness of the thinnest metal to be connected, nor more than one inch for each one thousand pounds of designed strength of either adjoining weld. Sufficient weld strength shall be provided to transmit the shearing stresses between joined parts caused by flexure due to long column action, applied bending moments, and any beam reactions or other loads tending to compress the member unequally.

Qualification of Operators for Welding

Par. 6368. All welding on structural members, plate or pipe, in the City of Baltimore, shall be performed under processes and by persons qualified under the requirements of the "Standard Qualification Procedure, Section I, Manual Arc and Gas Welding" of the American Welding Society, January 1938 Edition, except as provided in Paragraph 6368 of this Code, and the values and forms given in the "Appendix" of said manual shall be part of the requirements. Qualification tests shall be made, and appropriate certificates shall be issued to qualified applicants, by the Bureau of Standards of the Mayor and City Council of Baltimore or by any testing laboratory approved by the Buildings Engineer.

Process qualification tests shall not be required if, in the opinion of such Bureau of Standards or any approved testing laboratory, the process to be used is of an accepted standard type with respect to technique, materials to be welded, and filler metals. When required by the Buildings Engineer, process qualification tests shall be made for all applications and positions of welds to be used in any particular welding operation or work.

Persons to perform welding in the City of Baltimore shall be required to pass the specified tests for all applications and positions of welding to be used in any particular welding operation or work. A welder's certificate shall have a photograph of the welder attached thereto, shall state the name and address of the welder, and shall contain the following information pertaining to the test which was the basis upon which the said certificate was issued: the welding process used, nature of flame or electric current, base metal, the American Welding Society classification number of filler metal, preparation of base metal, number of passes, type and position of the weld, result of the tests, place of welding and testing specimens, witness of the welding, name of person making the test and any other information required by the Buildings Engineer. This certificate shall be issued for one year, and extended from year to year, providing that the operator has been employed on welding work for at least six months out of the preceding year. A copy of the certificate shall be filed with the Buildings Engineer.

The back of the certificate shall be reserved for a complete record of the welding operator's employment. The employer shall note the starting and terminating days of the employment with a complete record of the type of welding performed by the operator.

Inspection of Welding

Par. 6369. Any welding to be done on a structure or part thereof shall be performed under the inspection of a responsible inspection company or agency approved by the Buildings Engineer and employed by the contractor, owner or engineer. This inspection company or agency shall maintain on the job, at all times during the welding, a representative who shall certify as to the quality of the welding and render reports to the Buildings Engineer.

Every weld connection or structure shall be so stamped or marked that the welding operator of each weld and the inspection company or agency may be readily identified. Welds found deficient in dimension, but not in quality, may be enlarged by additional welding. Any weld found deficient in quality or made contrary to the approved drawings and specifications shall be removed by chipping. A cracked weld shall be removed throughout its entire length.

SECTION 637

STEEL JOISTS

Scope of Steel Joists

Par. 6370. Steel joists shall include any solid web beam with a web thickness less than 0.2 inches, truss-shaped steel members, pressed or expanded sheet metal members, expanded rolled sections, or any other similar members approved for directly supporting floor and roof slabs or planking, without intermediate supporting members.

Fabrication of Steel Joists

Par. 6371. Steel joists shall be fabricated from steel which meets the requirements for structural steel in Paragraph 6310. Welded joints and connections shall meet the requirements of Section 636.

Steel joists, unless galvanized, shall be given one coat of approved paint, before erection, by either dipping or spraying.

Design Loads for Steel Joists

Par. 6372. Steel joists shall be designed for the loads specified in Chapter 60. The joists, when erected and bridged, shall be capable of safely sustaining a concentrated load of at least 800 pounds at any point on any one joist. Such point shall be a panel point in the case of an open web joist.

Design of Steel Joists

Par. 6373. Steel joists, having solid webs, shall be designed as beams, in which the extreme fiber stress shall not exceed 18,000 pounds per square inch nor

$$\frac{20{,}000}{1+\frac{l^2}{2000b^2}}$$

Webs made of two or more sheets of metal shall be considered as separate members, each carrying its share of the shear.

Open web steel joists shall be designed as trusses in which the stresses, in pounds per square inch, in tension members shall not exceed 18,000 and in compression members 15,000, nor

$$\frac{18{,}000}{1+\frac{l^2}{18{,}000r^2}}$$

The $\frac{l}{r}$ of all compression members, when the floor system is completed, shall not exceed 120. During construction, the $\frac{l}{r}$ of the top chord between bridging shall not exceed 200.

Members subject to combined axial and bending stresses shall meet the requirements of Paragraph 6302.

When a concrete top slab has a thickness greater than one-fourteenth of the distance between panel points, or when other construction carries the loads to panel points, the bending stress in the top chord may be neglected, but the bending stresses shall be computed for all other conditions.

Maximum Span for Steel Joists

Par. 6374. The span of joists having an all steel top chord shall not exceed 550 times the lateral radius of gyration, but in case the top chord consists of a flat top section continuous with a center web, the radius of a gyration of the top plate alone shall be taken. In the case of joists having a top chord of steel with a wood nailing strip attached, the span shall not exceed 160 times the total width of the top chord. The span shall not exceed 24 times the depth of the steel portion of the joist.

Joints and Connections of Steel Joists

Par. 6375. Joints and connections of all steel joists shall be designed with as little eccentricity as possible and all stresses due to eccentricity shall be included with the primary stress in designing. Joints and connections shall be capable of resisting a stress of not less than 3 times the design stress.

Minimum Bearing for Steel Joists

Par. 6376. Steel joists shall have a bearing of at least 4 inches on masonry or reinforced concrete and at least two and one-half inches on steel. The unit bearing pressure on masonry or reinforced concrete shall not exceed 200 pounds per square inch, and on steel, it shall not exceed 1000 pounds per square inch.

Anchors for Steel Joists

Par. 6377. The ends of all steel joists supported on steel beams shall be secured with not less than either two one-inch welds, one half-inch bolt or rivet, or by an approved hook. The ends of all steel joists supported on masonry walls shall be bedded and completely encased in mortar and every third joist shall be anchored to the masonry with an anchor equivalent to a three-eighth inch round bar. Steel joists parallel to masonry walls, or to steel or concrete beams shall have both top and bottom chords or flanges anchored thereto, in the line of the bridging, with anchors not less than three-sixteenths inch thick.

Design of Bridging for Steel Joists

Par. 6378. Bridging for steel joists shall be of an approved type capable of transmitting at least 500 pounds from each joist to the adjacent joists and shall support the top chord or flanges from lateral displacement.

Bridging shall be provided at equal intervals not exceeding the following:

Span in Feet	Number of Lines of Bridging
Up to 14	One row
14 to 21	Two rows
21 to 32	Three rows

Unless steel joists are supported at their ends by web connections, built into masonry walls or otherwise supported laterally, or have their end bearing within 4 inches of the top chord, they shall have bridging at their ends. Bridging shall also be placed under the full length of walls supported transversely on the joists.

Prohibited Use of Steel Joists

Par. 6379. Steel joists are prohibited in the following locations:

All Type A, Fireproof, buildings.
Floors of garages.
All buildings subjected to vibrating loads.
First floor of any building where there is no basement or cellar.
All floors designed for live loads exceeding 95 pounds per square foot.

SECTION 638

FABRICATION AND ERECTION OF METAL STRUCTURES

Workmanship on Structural Metal Members

Par. 6380. All workmanship shall be equal to the best practice in modern structural shops.

All material shall be straight and true. If straightening or flattening is necessary, it shall be done by a process and in a manner that will not injure the material. Sharp kinks or bends shall be cause for rejection.

Cuts and Notches in Structural Metal Members

Par. 6381. Structural metal members shall not be cut, notched, or pierced for clearance of pipes, conduits, wires, ducts or for other reasons in such a way as to impair their strength unless provisions therefor have been made in the design.

Holes for Rivets and Bolts

Par. 6382. Holes for rivets, rivet bolts and unfinished bolts shall be not more than one-sixteenth inch larger than the nominal diameter of the rivet or bolt.

Holes for turned bolts shall be not more than one-thirty-second inch larger than the external diameter of the bolt. All drilling or reaming for turned bolts shall be done after the parts to be connected are assembled.

Drifting to enlarge unfair holes shall not be permitted. Holes that must be enlarged to admit the rivets shall be reamed. Poor matching of holes shall be cause for rejection.

Heating of Rolled Sections

Par. 6383. Whenever rolled sections, except minor details, are heated, they shall be thoroughly annealed. This regulation does not apply to gas cutting, permitted in Section 636.

Finished Joints

Par. 6384. Compression joints depending upon contact bearing shall have the bearing surfaces truly machined to a common plane after the members are riveted or welded. All other joints shall be cut straight.

Tolerances for Fabricated Metal Members

Par. 6385. Fabricated metal members shall be true to line and free from twists, bends, and open joints.

Compression members may have a lateral variation not greater than 1/1000 of the axial length between points which are to be laterally supported.

Erection of Metal Structures

Par. 6386. The metal frames of buildings or other structures shall be erected true and plumb, and temporary bracing shall be provided to support the loads to which the structure may be subjected, including erection equipment. Such bracing shall be left in place as long as may be required for safety.

Time of Riveting or Welding Metal Structures

Par. 6387. No field riveting or welding shall be done in any portion of a structure until that portion has been properly plumbed and aligned.

Erection Tolerances for Metal Structures

Par. 6388. In the setting or erecting of steel or metal work the individual pieces shall be considered plumb or level when the error does not exceed one in five hundred. Exterior columns and columns adjacent to elevator shafts shall not be out of plumb in excess of one in one thousand, in the total height of the columns.

Painting Steel Structures

Par. 6389. Paint for steel structures shall be of an approved quality. It shall be thoroughly mixed before applying and shall be evenly applied and well worked into joints and open spaces. Paint shall not be applied when the air temperature is below 40 degrees Fahrenheit nor when the metal surfaces are damp or frosted.

Surfaces of steel work to be painted shall be thoroughly cleaned by effective means of all rust, loose mill scale, dirt, oil or grease and other foreign substances.

Before leaving the shop, all steel work, except where galvanized, or where it is to be entirely encased in concrete, shall be given at least one coat of paint. Shop painting of welded work shall be done after the welding is completed, except that linseed oil instead of paint shall be applied on areas where field welds are required.

Parts inaccssible after assembly shall be given at least two coats of shop paint.

Contact surfaces shall be cleaned by effective means, before assembly, but need not be painted.

Machine-finished surfaces shall be protected against corrosion by a suitable coating.

After the erection of steel work, all field rivets, bolts and welds, and all serious abrasions to the shop paint, shall be spot painted with the same paint used for the shop coat, before general field painting. Rivets and welds shall not be painted until after inspection and approval.

General field painting shall consist of at least one coat.

SECTION 639

STEEL DECKS AND OTHER METAL FLOORS

Preformed Steel Decks

Par. 6390. The metal for preformed steel decks shall have a minimum thickness of 0.035 of an inch (20 gage) for floors and 0.022 of an inch (24 gage) for roofs.

The allowable uniform load on a panel of preformed steel deck shall be one-fourth of that load which causes the panel to fail or to deflect more than one-seventieth of the span, when one-half of the load is placed at each of the quarter-points from the supports across the full width of the panel. Panels shall be assumed as simply supported with spans equal to the center to center distance between supports.

Preformed steel decks shall be fastened to their supports by proper riveting, welding, locking or clipping, and such operations shall be subject to the approval of the Buildings Engineer.

Battledeck Floors

Par. 6391. For battledeck floors, the minimum thickness of plain plates shall be one-eighth inch and of checkered and similar plates, three-sixteenths inch, exclusive of the height of the raised pattern. The plates shall be securely fastened to their supports by rivets, bolts or clips, spaced not over 30 inches or by welding.

Floor Grating

Par. 6392. The minimum depth of open mesh floor grating shall be three-quarters inch and all metal bars used in such gratings shall be at least one-eighth inch in thickness.

The grating shall be securely fastened to the supports by rivets, bolts or clips, spaced not over 30 inches on center or by welding.

Anchoring Metal Floors to Walls

Par. 6393. Where metal plate floors or gratings are relied on as lateral supports of masonry walls which are parallel to the floor beams, the wall shall be anchored to the nearest beam by substantial metal anchors spaced not over 6 feet on centers. Such floors shall have metal plates at least one-quarter inch thick securely bolted, riveted or welded to the supporting beams or the beams shall be rigidly braced in the horizontal plane.

Plates shall have at least 4 inches of bearing on masonry walls.

Openings In Metal Floors

Par. 6394. Openings in metal floor plates or gratings shall be supported along such edges which are more than 16 inches long and are not parallel to the span used in the design of the floor plates or gratings.

In case of circular, elliptical, or similar openings the sides of the circumscribing rectangle shall be taken as the edge of the opening.

CHAPTER 64

CONCRETE MATERIALS

Sec. 641. Cements.
Sec. 642. Aggregates.
Sec. 643. Metal Reinforcement.
Sec. 644. Water.
Sec. 645. Admixtures.
Sec. 646. Tests of Concrete Materials.
Sec. 647. Storage of Concrete Materials.
Sec. 648. Materials for Special Concretes.

SECTION 641

CEMENTS

Classification of Cements

Par. 6410. Cements shall be classified as natural, standard Portland, high-early-strength, puzzolanic, acid resistive and high temperature resistive cements.

Natural Cement

Par. 6411. Natural cement shall meet the requirements of the "Standard Specification for Natural Cement" of the American Society for Testing Materials, Serial Designation C10-37.

Standard Portland Cement

Par. 6412. Standard Portland Cement shall include all cements that conform to the requirements of the "Standard Specifications for Portland Cement" of the American Society for Testing Materials, Serial Designation C9-38.

A bag of Portland cement weighing 94 pounds net shall be assumed to measure one cubic foot.

High-Early-Strength Cements

Par. 6413. High-early-strength cements shall include high-early-strength Portland Cement and high alumina cement.

High-early-strength Portland cement shall include all cements which meet the requirements of the "Standard Specifications for High-Early-Strength Portland Cements" of the American Society for Testing Materials, Serial Designation C74-39.

Puzzolanic Cements

Par. 6415. Puzzolanic cements shall include all mixtures of standard Portland cement with tufa, puzzolana or slag.

Puzzolanic cements shall meet the requirements of standard Portland cement in time of setting and soundness. After 10 days, the strength of mortar briquettes made of puzzolanic cements shall equal that of similar mortar briquettes made with standard Portland cement.

Acid-Resistive Cements

Par. 6416. Acid-resistive cements shall include high-alumina cement and all cements which resist the action of sulphuric acids, lactic acids, other strong acids, sugar solutions and sea water.

High-Temperature-Resistive Cements

Par. 6417. High-temperature resistive cements shall include high-alumina cements and all other cements which resist the effect of exposure to high temperature.

Uses of Cements in Concrete

Par. 6418. Standard Portland cement or high-early-strength Portland cement shall be used under ordinary conditions in all concrete, except that special cements shall be permitted to be used in controlled concrete under the following conditions:

a. High-alumina cement; only with the special permission of the Buildings Engineer.

b. Natural cement; in plain concrete where the compressive stress does not exceed 200 pounds per square inch, and the shearing stress 20 pounds per square inch.

c. Puzzolanic cements; in all concrete that is constantly kept wet.

Acid-resistive cements shall be used in special acid-resisting concrete.

High temperature resisting cements shall be used in special high temperature resisting concrete.

For the materials in special concretes, refer to Section 648.

SECTION 642.

AGGREGATES

Scope of Concrete Aggregates

Par. 6420. Concrete aggregates shall include sand, gravel, crushed rock, cinders, slag and other suitable inert materials which conform to the requirements of this Section.

Fine Aggregates

Par. 6421. Fine aggregates shall consist of natural sand or other approved inert materials having similar characteristics or a combination thereof. They shall be free from injurious amounts of organic impurities. They shall consist of hard, strong, durable particles and conform to the following requirements:

The amount of deleterious substances shall not exceed the following limits:

TABLE 6421T1

	Permissible limits Per cent, by weight
Clay lumps	1.5
Coal and lignite.....................	1.0
Material finer than No. 200 sieve:	
a. In concrete subject to surface abrasion.....................	3.0
b. In other concrete..............	5.0
Other deleterious substances, such as shale, alkali, mica, soft and flaky particles.........................	3.0

The amount of deleterious substances shall be established by tests required in Paragraph 6463.

Fine aggregates shall be well graded from coarse to fine and, when tested as required in Paragraph 6464, shall conform to the following requirements:

TABLE 6421T2

	Per Cent
Passing a $\frac{3}{8}$-in. sieve	100
Passing a No. 4 sieve	95 to 100
Passing a No. 16 sieve	45 to 80
Passing a No. 50 sieve	5 to 30
Passing a No. 100 sieve	0 to 8

Fine aggregates of sand or crushed rock shall be of such quality that when made into a mortar and subjected to a mortar strength test as required in Paragraph 6462, they shall develop a compressive strength at 7 and 28 days of not less than 100 per cent of that developed by a mortar prepared in the same manner with the same cement and a graded Ottawa sand having a fineness modulus of 2.40 ± 0.10.

Fine aggregates of slag, burnt clay or other lightweight aggregates shall develop a compressive strength of not less than 70 per cent of that required for sand or crushed rock.

Coarse Aggregates

Par. 6422. Coarse aggregates shall consist of Class I or Class II crushed rock aggregate, gravel, slag, cinder, or other approved inert materials of similar characteristics, or combination thereof, having hard, strong, durable pieces, free from adherent coatings and conforming to the requirements of these specifications.

The amount of deleterious substances shall not exceed the following limits:

TABLE 6422T1

	Permissible Percentage by Weight
Material finer than No. 200 sieve	1.50
Coal and lignite	1.0
Clay lumps	0.25
Soft fragments	5.0
Other deleterious substances, such as alkali, friable, thin, elongated, or laminated pieces	3.0

The amount of deleterious substances shall be established by tests required in Paragraph 6463.

Concrete coarse aggregates shall be graded according to the limits shown in the following table, as established by the test required in Paragraph 6464.

TABLE 6422T2

Crushed Stone, Gravel and Blast-Furnace Slag

Designated Size	Percentages Retained on Laboratory Sieves Having Square Openings						
	2 in.	1½ in.	1 in.	¾ in.	½ in.	⅜ in.	No. 4
2 in. to No. 4	0–5	......	30–65	......	70–90	......	95–100
1½ in. to No. 4	......	0–5	......	30–65	......	70–90	95–100
1 in. to No. 4	......	......	0–10	......	40–75	......	90–100
¾ in. to No. 4	......	......	......	0–10	......	45–80	90–100
½ in. to No. 4	......	......	......	......	0–10	......	85–100
2 in. to 1 in.	0–10	30–65	85–100	......	......	......	......
1½ in. to ¾ in.	......	0–10	45–80	85–100	......	......	......

Coarse aggregate shall pass a sodium sulphate accelerated soundness test, except that aggregates failing in such tests may be used if they pass a satisfactory freezing and thawing test. Such a test shall be as required in Paragraph 6468.

The maximum size of any coarse aggregate shall be one-fifth of the narrowest dimension of the formwork, and three-quarters of the minimum clear spacing between reinforcing bars of the concrete in which the aggregate is used. By maximum size is meant the smallest sieve size which will pass 85 per cent by weight of the aggregate.

Class I. Crushed Rock Aggregates

Par. 6423. Class I crushed rock aggregates shall consist of:

a. Limestones, which shall include all stratified rocks, consisting principally of calcite or a combination of calcium and magnesium carbonates.

b. Dolomites, which shall include all limestones containing approximately equal parts of calcium and magnesium carbonates.

c. Trap rock—such as basalts, diabase, gabbros and diorites.

d. All crushed rock containing less than 60 per cent of silica.

Limestone containing fine dust shall be thoroughly washed before using in concrete.

Class II. Crushed Rock Aggregates

Par. 6424. Class II crushed rock aggregates include granite or any crushed rock containing 60 per cent or more silica.

Gravel Aggregates

Par. 6425. Gravel shall be classified as follows:

Calcareous gravel, which shall include all gravel having the composition and characteristics of limestone and dolomites.

Siliceous gravel, which shall include all gravel containing 60 per cent or more silica.

Gravel conglomerate, or gravel coated with soft limestone, clay, or disintergrating rock matrix, shall not be used as aggregate.

Slag Aggregates

Par. 6426. Slag used as concrete aggregate shall be made from blast furnace slag which, in addition to meeting the other requirements for aggregates in Paragraphs 6421 and 6422, shall weigh not less than 1800 pounds per cubic yard, contain not over 2 per cent of sulphur, and be weathered for not less than three months.

Slag aggregates shall not be permitted to be used in ordinary concrete and in beams, girders, trusses, columns, footings or other important structural members of controlled concrete.

Cinder Aggregates

Par. 6427. Cinders used for concrete aggregate shall be obtained from burnt coal and shall contain not more than one per cent of sulphur or sulphur compounds. They shall contain not more than 10 per cent by weight of combustible matter and shall be properly prepared by crushing and screening to give a graded coarse aggregate. Cinder aggregates shall be weathered not less than 3 months.

Cinder aggregates shall not be permitted in concrete for structural purposes.

Mixed Aggregates

Par. 6428. Where mixed aggregates containing two or more approved aggregates in various proportions are used in concrete, they shall be restricted by the limitation placed on the individual aggregates.

Non-Conforming and Other Aggregates

Par. 6429. Shale or clay used as concrete aggregate shall be burnt at temperatures of 1800 degrees to 2000 degrees Fahrenheit and used only if permitted by the Buildings Engineer.

Other aggregates shall show by test or actual service that they produce concrete of the required strength, durability, water-tightness and wearing qualities, and shall be used only if permitted by the Buildings Engineer.

SECTION 643

METAL REINFORCEMENT

Metal Reinforcement Used in Concrete

Par. 6430. Metal reinforcement used in concrete shall be billet steel, rail steel, axle steel, welded wire fabric, cold drawn wire, and non-magnetic steel alloys or other materials that meet the requirements of this section.

Reinforcement made from scrap iron ingots or rerolled steel other than rail or axle steel shall not be used.

Billet-Steel Reinforcement

Par. 6432. Billet-steel bar reinforcement shall meet the requirements of the "Standard Specifications for Billet-Steel Concrete Reinforcement Bars" of the American Society for Testing Materials, Serial Designation A15-39.

Billet-steel structural shapes used as reinforcement shall meet the requirements of Paragraph 6310.

Rail-Steel Reinforcement

Par. 6433. Rail-steel reinforcement shall meet the requirements of the "Standard Specifications for Rail-Steel Concrete Reinforcement Bars" of the American Society for Testing Materials, Serial Designation A16-35.

Axle-Steel Reinforcement

Par. 6434. Axle-steel reinforcement shall meet the requirements of the "Standard Specifications for Axle-Steel Reinforcement Bars" of the American Society for Testing Materials, Serial Designation A160-39.

Welded Steel Wire Fabric and Cold-Drawn Wire Reinforcement

Par. 6435. Welded steel wire fabric reinforcement shall meet the requirements of the "Standard Specifications for Welded Steel Wire Fabric for Concrete Reinforcement" of the American Society for Testing Materials, Serial Designation A185-37.

Cold drawn steel wire reinforcement shall meet the requirements of the "Standard Specifications for Cold-Drawn Steel Wire for Concrete Reinforcement" of the American Society for Testing Materials, Serial Designation A82-34.

Welded steel wire fabric and cold drawn wire shall not be used as main reinforcement in beams, girders, trusses and columns.

Other Concrete Reinforcing Materials

Par. 6439. Reinforcement that does not conform to the requirements of this section, but has shown, by test or actual service, that it can develop the required tensile strength and bond, may be used in concrete, where permitted by the Buildings Engineer.

SECTION 644

WATER

Water Requirements

Par. 6440. Water used in mixing concrete shall be clear from deleterious amounts of acids, alkalis or organic material.

SECTION 645

ADMIXTURES

General Requirements for Admixtures

Par. 6450. Admixtures include lime, calcium chloride, siliceous admixtures, barium carbonate, and such other materials which, when added to concrete mixes, produce certain specific properties desired in the concrete and are in no way detrimental thereto.

The water-cement ratio shall not be increased when an admixture is used, but the amount of mixing water shall in all cases be reduced by not less than the amount of any wet or liquid admixture used.

Lime Admixtures

Par. 6451. Hydrated lime used as admixture in concrete shall meet the requirements of Paragraph 6194. It shall be permitted only in plain concrete up to 15 per cent of the volume of the cement and in reinforced concrete not subject to constant hydrostatic pressure up to 10 per cent of the volume of the cement.

Hydraulic lime used in concrete shall meet the requirements of the "Tentative Specifications for Hydraulic Hydrated Lime for Structural Purposes" of the American Society for Testing Materials, Serial Designation C141-38. It shall be permitted in concrete in accordance with the conditions set forth in a special certificate issued by the Buildings Engineer.

Calcium Chloride Admixtures

Par. 6452. Calcium chloride used as admixture in concrete shall meet the requirements of the "Standard Specifications for Calcium Chloride" of the American Society for Testing Materials, Serial Designation D98-34.

Calcium chloride dissolved in the mixing water shall be permitted only in controlled concrete, in an amount not exceeding 2 pounds to a bag of cement.

Siliceous Admixtures

Par. 6453. Siliceous admixtures shall include diatomaceous silica, colloidal tripoli silica, pumicite and other similar products.

A moisture-free sample of a siliceous admixture shalll contain not less than 70 per cent by weight of silica nor more than 14 per cent by weight of alumina. The combined weight of silica, alumina and iron oxides shall be not less than 85 per cent of the total weight of the sample. Loss by ignition shall not exceed 7 per cent.

Siliceous admixtures shall not be used in excess of the amount recommended by the manufacturer.

Siliceous admixtures furnished in paste form shall be included as part of the total water content of the concrete.

Barium Carbonate Admixtures

Par. 6454. Barium carbonate shall be permitted only in concrete containing slag or cinders to combine with sulphur so as to form barium sulphate, an insoluble substance, if approved by the Bureau of Standards of the Mayor and City Council of Baltimore.

Other Concrete Admixtures

Par. 6459. Admixtures not herein regulated shall be used only upon approval by the Buildings Engineer, who shall issue a certificate for their use.

SECTION 646

TESTS OF CONCRETE MATERIALS

Scope of Tests of Concrete Materials

Par. 6460. This Section shall include methods of sampling of aggregates, tests for deleterious substances, grading, absorption and moisture content of aggregates.

Methods of tests on concrete materials, not herein referred to, shall be in accordance with the standards of the American Society for Testing Materials.

Sampling of Concrete Aggregates for Tests

Par. 6461. To secure samples of concrete aggregates for tests from cars or boats, separate samples from the top, middle and bottom shall be taken and, if practicable, the sampling shall be done during unloading.

Separate samples shall be taken from the tops and the chutes of bins. When sampling the contents of the chutes, at least one-half cubic yard of material shall be run off and the sample taken therefrom.

When sampling a stock pile, an approximately equal amount shall be taken from every part of the pile, and in case of sand or gravel, care shall be taken to avoid an excessive sampling at the bottom of the pile.

All samples taken shall be well mixed into a composite sample, and the sample for the test shall be obtained by the quartering method. Such samples shall weigh not less than 20 pounds for sand and 50 pounds for gravel or crushed stone, but no sample for crushed stone shall weigh less than 50 times the weight of the largest stone.

Test for Structural Strength of Sand

Par. 6462. To determine the suitability of a fine aggregate by mortar strength test, the procedure described in the "Standard Method of Test for Structural Strength of Fine Aggregate Using Constant Water Cement Ratio" of the American Society for Testing Materials, Serial Designation C87-39, shall be used.

Tests for Deleterious Substances in Concrete Aggregates

Par. 6463. To determine the amount of deleterious substances in concrete aggregate, the following standard testing methods shall be used:

"Standard Method of Test for Amount of Material Finer Than No. 200 Sieve in Aggregates" of the American Society for Testing Materials, Serial Designation C117-37.

"Standard Method of Test for Coal and Lignite in Sand" of the American Society for Testing Materials, Serial Designation C123-39.

"Method of Test for Percentage of Shale in Aggregate", Standard Method T-10 of the American Association of State Highway Officials.

"Method of Test for Quantity of Soft Pebbles in Gravel", Standard Method T-8 of the Amercian Association of State Highway Officials.

Tests for Grading of Aggregates

Par. 6464. To determine the grading of particles in concrete aggregates, the method described in the "Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates" of the American Society for Testing Materials, Serial Designation C136-39, shall be used.

Tests for Absorption of Fine Aggregates

Par. 6465. To determine the exact amount of moisture absorption of fine aggregates, the method described in the "Standard Method of Test for Specific Gravity and Absorption of Fine Aggregate" of the American Society for Testing Materials, Serial Designation C128-39, shall be used.

Tests for Absorption of Coarse Aggregates

Par. 6466. To determine the exact amount of moisture absorption of coarse aggregates, the method described in the "Standard Method of Test for Specific Gravity and Absorption of Coarse Aggregate" of the American Society for Testing Materials, Serial Designation C127-39, shall be used.

Test for Surface Moisture in Fine Aggregates

Par. 6467. To determine the amount of moisture in fine aggregates, the procedure described in the "Standard Method of Test for Surface Moisture in Fine Aggregate" of the American Society for Testing Materials, Serial Designation C70-30, shall be used.

Tests for Durability of Coarse Aggregate

Par. 6468. To determine the durability of coarse aggregates for concrete the following standard testing methods shall be used:

"Tentative Method of Test for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate", of the American Society for Testing Materials, Serial Designation C88-39T.

Method of freezing and thawing tests of drain tile as described in the "Standard Specification for Drain Tile" of the American Society for Testing Materials, Serial Designation C4-24.

SECTION 647

STORAGE OF CONCRETE MATERIALS

Storage of Cement

Par. 6470. Cement shall be stored in such a manner as to permit easy access for proper inspection and identification of each shipment, and in a suitable weather-tight building which will protect the cement from dampness. Cement remaining in storage for a period greater than 6 months shall be retested.

Storage of Concrete Aggregates

Par. 6471. Aggregates shall be stored in such a manner as to prevent the intrusion of foreign matter.

SECTION 648

MATERIALS FOR SPECIAL CONCRETE

Materials for Acid-Resisting Concrete

Par. 6481. Concrete which is normally exposed to the action of sulphuric acid, lactic acid, other strong acids, sugar solution or sea water shall be made with acid-resisting cement and siliceous aggregate.

Materials for High-Temperature-Resisting Concretes

Par. 6482. Concrete which is normally exposed to the effect of temperature over 1200 degrees Fahrenheit shall be made with high-temperature-resisting cement and burnt clay or shale aggregate.

CHAPTER 65

DESIGN OF REINFORCED CONCRETE CONSTRUCTION

Sec. 650—Requirements for Reinforced Concrete Design.

Sec. 651—Allowable Stresses for Reinforced Concrete.

Sec. 652—Formulas for Reinforced Concrete Design.

Sec. 653—Design Requirements for Reinforcement.

Sec. 654—Concrete Slab, Beam and Girder Design.

Sec. 655—Flat Slab Systems.

Sec. 656—Reinforced Concrete Column and Wall Design.

Sec. 657—Reinforced Concrete Footing Design.

Sec. 658—Design of Precast Reinforced Concrete.

Sec. 659—Design of Special Reinforced Concrete Structures .

SECTION 650

REQUIREMENTS FOR REINFORCED CONCRETE DESIGN

General Requirements for Reinforced Concrete Design

Par. 6500. Reinforced concrete shall be designed by methods admitting of rational analysis according to established principles of mechanics, supplemented by the assumptions herein specified; to support loads and withstand the forces to which it is subject, without exceeding the stresses allowed in this Chapter for the various materials.

Concrete Definitions

Par. 6501. *Aggregate* shall mean inert material which is mixed with cement and water to produce concrete.

Column shall mean an upright compression member the length of which exceeds three times its least lateral dimension.

Column Capital shall mean an enlargement of the upper end of a reinforced concrete column designed and built to act as a unit with the column and slab.

Concrete shall mean a mixture of cement, fine aggregate, coarse aggregate and water.

Deformed Bar shall mean reinforcing bars with closely spaced shoulders, lugs or projections formed integrally with the bar during rolling. Wire mesh with welded intersections not farther apart than twelve inches in the direction of the principal reinforcement and with cross wires not smaller than No. 10 may be rated as a deformed bar.

Effective Area of Concrete shall mean the area of a section which lies between the centroid of the tensile reinforcement and the compression face of a slab or beam.

Effective Area of Reinforcement shall mean the area obtained by multiplying the right cross-sectional area of the metal reinforcement by the cosine of the angle between its direction and that for which the effectiveness of the reinforcement is to be determined.

Negative Bending Moment shall mean a bending moment which causes tension above the neutral axis in a horizontal or nearly horizontal structural member.

Negative Reinforcement shall mean reinforcement so placed as to resist tension due to negative bending moments.

Pedestal shall mean an upright compression member whose height does not exceed three times its least lateral dimension.

Ratio of Reinforcement shall mean the ratio of the effective area of the reinforcement cut by a section of a structural member to the effective area of the concrete at that section.

Reinforced Concrete shall mean concrete in which metal other than that provided for shrinkage or temperature changes is embedded in such a manner that the two materials act together in resisting forces.

Strut shall mean a compression member used to restrain other members.

Surface Water shall mean the water carried by the aggregate except that held by absorption within the aggregate particles themselves.

Symbols and Notations for Concrete Design

Par. 6502.

A_g —The overall or gross area in square inches of spirally-reinforced or tied columns.

b —Width of rectangular beam or slab, in inches.

b' —Thickness of web in beams of I or T sections, in inches.

b_1 —Side dimensions, in feet, of the dropped panel of a flat slab.

c —Diameter, in feet, of column capital of a flat slab, as defined in Paragraph 6557.

d —Depth, in inches, from compression face of beam or slab to centroid of longitudinal tensile reinforcement.

f_c —Compressive stress, in pounds per square inch, of concrete.

f'_c —Ultimate compressive strength of concrete in pounds per square inch.

f_s —Tensile stress, in pounds per square inch, in longitudinal and circumferential reinforcement.

h —The total depth of beam, in inches.

H —Unsupported length of columns or height of walls, in feet.

I —Moment of inertia of a section about the neutral axis for bending.

j —Ratio of distance between centroid of compression and centroid of tension to the depth, d.

k —The ratio of the depth of the neutral axis to the depth, d, of the beam.

l —Span length, in feet, of beam or slab; span length of flat slab, center to center of columns, in the direction in which moments are considered.

l_1 —Span length, in feet, of flat slab panel, center to center of columns, perpendicular to the rectangular direction in which moments are considered.

n —Ratio of modulus of elasticity of steel to that of concrete.

p_g —Ratio of the effective cross-sectional area of vertical reinforcement to the gross area A_g.

t_0 —Thickness, in inches, of flat slabs including the dropped panel.

t_1 —Thickness of flat slab, in inches, without dropped panels.

t_2 —Thickness of flat slab, in inches, with dropped panels at points outside the dropped panel.
v —Shearing stress, in pounds per square inch.
v_c —Shearing stress in pounds per square inch, permitted on the concrete of the web.
V —Total shear, in pounds.
v_t —Maximum torsional shearing stress, in pounds per square inch.
w —Uniformly distributed load, in pounds per foot of length.

General Assumptions for Design of Reinforced Concrete

Par. 6503. Calculations shall be made with reference to allowable stresses and safe loads and not with reference to ultimate strengths and ultimate loads. It shall be assumed that:

A plane section before bending remains plane after bending, shearing distortions being neglected.

In determining the ratio n, the modulus of elasticity for concrete in compression is considered constant within the limits of working stresses and shall be taken as one thousand times the ultimate strength, and that for steel as 30,000,000 pounds per square inch.

The tensile resistance of concrete is neglected in flexure. The steel is assumed to take all of the tensile stress.

Determination of Span Length for Reinforced Concrete Members

Par. 6504. The minimum span length used for computing bending moments of freely supported and continuous beams, girders or slabs, and of restrained or partly restrained beams and girders shall be taken as the center to center distance between supports, but need not be more than the clear span plus the distances to the centers of the required bearing areas in case of a freely supported beam or slab of one span.

The minimum span length of restrained and partly restrained one-way slabs shall be taken as the clear distance between the faces of the supports.

For the unsupported length of columns, refer to Paragraph 6562.

Special Assumptions for Flexure Computations

Par. 6505. Reinforced concrete members restrained at their supports or consisting of a series of continuous spans shall be designed as required for statically indeterminate structures in Section 690, except that beams and slabs with span and load limitations as stated in Paragraphs 6541 and 6542 may be designed by using the coefficients given therein.

In restrained members, moments prevailing at the faces of supports may be considered as maximum negative moments.

In computing the relative stiffness of slabs, beams and columns, the value I of the slabs and beams shall be based on the entire concrete sections neglecting the reinforcement, and that of the columns on the entire concrete section plus the transformed steel section. The I assumed for the columns in computing the relative stiffness shall also be used in computing stresses.

When members are deepened near their supports by haunches, they may be analyzed as members of constant section, provided that the minimum depth is used throughout in computing bending stresses and that the additional depth at the support is utilized to resist shear only; otherwise a complete analysis shall be made.

Expansion Joints

Par. 6509. Expansion joints shall be provided in buildings or other structures, unless other means for heat expansions are provided, where there is an abrupt change in height or width of a building, and in buildings or other enclosed structures more than 300 feet long, and in bridges or other exposed structures more than 200 feet long. Such joints shall be placed not more than 200 feet apart in buildings or other enclosed structures, and not more than 100 feet apart in bridges or other exposed structures.

The linear change for a 100-foot length shall be assumed to be one-half inch for buildings or other enclosed structures, and one inch for bridges or other exposed structures.

Expansion joints shall separate the parts entirely, leaving them free to move independently.

Slabs or beams adjoining expansion joints shall be supported on separate columns or walls, or on a suitable sliding joint with a minimum of resistance to moving.

SECTION 651

ALLOWABLE STRESSES FOR REINFORCED CONCRETE

Allowable Stresses for Ordinary Concrete

Par. 6511. The stresses in pounds per square inch for ordinary concrete shall not exceed the following values:

	Mix 1:2:4
Flexure:	
Compression	650
Compression adjacent to supports in continuous and restrained members	750
Shear:	
Beams or slabs without web reinforcement and without special anchorage of longitudinal steel	40
Beams with properly designed web reinforcement, and with special anchorage of longitudinal steel	120
Bond:	
In beams, slabs and one-way footings:	
Plain bars	80
Deformed bars	100
In two-way footings:	
Plain bars	60
Deformed bars	75
Where special anchorage is provided, one and one-quarter times these values in bond may be used. See Paragraph 6533.	
Bearing:	
On full area	500
One-half area	750
Ratio n	15

Allowable Stresses for Reinforcement in Ordinary Concrete

Par. 6512. The stresses in pounds per square inch for reinforcement in ordinary concrete shall not exceed the following values:

Tension:	
Billet steel, rail steel, axle steel, welded wire fabric and cold drawn steel wire	16,000
Web reinforcement	16,000
Compression:	
Bars in beams	Compressive working stress of concrete multiplied by the ratio n

Allowable Stresses for Controlled Concrete

Par. 6513. The stresses for controlled concrete shall not exceed the following values:

Flexure:	
Compression	$0.45f'_c$
Shear:	
Beams with no web reinforcement and without special anchorage of longitudinal steel	$0.02f'_c$
Beams with no web reinforcement, but with special anchorage of longitudinal steel	$0.03f'_c$
Beams with properly designed web reinforcement but without special anchorage of longitudinal steel	$0.06f'_c$
Beams with properly designed web reinforcement and with special anchorage of longitudinal steel	$0.12f'_c$
Flat slabs at the critical sections	$0.03f'_c$
Footings where longitudinal bars have no special anchorage	$0.02f'_c$
Footings where longitudinal bars have special anchorage	$0.03f'_c$
Bond:	
In beams and slabs and one-way footings:	
Plain bars or structural shapes	$0.04f'_c$, but not more than 160 pounds per sq. in.
Deformed bars	$0.05f'_c$, but not more than 200 pounds per sq. in.
In multiple-way footings:	
Plain bars or structural shapes	$0.03f'_c$, but not more than 160 pounds per sq. in.
Deformed bars	$0.375f'_c$, but not more than 200 pounds per sq. in.

Where special anchorage is provided, one-and-one-half times the preceding values in bond may be used, but in no case more than 200 pounds per sq. in. for plain bars or 250 pounds per sq. in. for deformed bars. See Paragraph 6533.

Bearing:	
On full area	$0.25f'_c$
On partial area	See Paragraph 6575.
Torsional stress combined with shear in beams with reinforcement and longitudinal steel with special anchorage	$0.15f'_c$
Compression in members subjected to bending and direct stress	See Paragraph 6567.

Allowable Stresses for Reinforcement in Controlled Concrete

Par. 6514. The stresses in pounds per square inch for reinforcement in controlled concrete shall not exceed the following values:

Tension:	
Billet, rail, and axle steel	20,000
Wire mesh or cold drawn wire, not exceeding one-half inch in diameter, used in one way slabs	50 per cent of the minimum yield point, as established by The American Society for Testing Materials Standards, but not to exceed 25,000.
Other reinforcing metals	30 per cent of the minimum yield point, but not more than 20,000
Web reinforcement	16,000
Compression:	
Bars in beams	Twice the compressive stress of concrete multiplied by the ratio n, but not more than 16,000

SECTION 652

FORMULAS FOR REINFORCED CONCRETE DESIGN

Combined Bending and Direct Stresses

Par. 6524. When designing reinforced concrete members, subjected to bending and direct stress, such as members of rigid frames, arch ribs, eccentrically loaded columns, and columns resisting bending moments, the effect of such combined loading shall be considered.

Bond Stress

Par. 6525. In the tensile reinforcement parallel to the compressive face of concrete members, the computed bond stress shall be not less than that obtained from the following formula:

$$u=\frac{V}{\Sigma_o jd}$$

where u is the bond stress in pounds per square inch of the the surface area of the bar, and Σ_o is the sum of the perimeters, in inches, of the bars.

Shearing Unit Stress

Par. 6526. The computed shearing unit stress v in reinforced concrete beams shall be not less than that obtained from the following formula:

$$v=\frac{V}{bjd}$$

For beams of I or T Section b′ shall be substituted for b in above formula.

In ribbed construction, where burned clay or concrete tile is used, b′ may be taken as permitted in Paragraphs 6596 and 6597.

Torsional Stress

Par. 6527. Girders or beams with eccentric loads restrained at their ends, or the marginal beams of flat slabs, shall be capable of resisting the torsional shearing stresses resulting from the unbalanced moments. Such stresses for rectangular sections shall be taken not less than that obtained from the following formulas:

$$v_t=\frac{9M_r}{2hb^2} \text{ at the mid-height of the outside face.}$$

$$v_t=\frac{9M_r}{2h^2b} \text{ at the center of the top and bottom.}$$

where M_r is the torsional moment in inch-pounds. In case of marginal beams of flat slabs, M_r shall be taken as one-half of the negative moment in the middle strip at the boundaries of such strip and as zero at mid-span.

Combined Shear and Torsional Stress

Par. 6528. The torsional unit shearing stress v_t, shall be combined with the direct shear. The combined torsional and direct shearing stresses shall not exceed the values given in Paragraph 6513. The positive shear to be resisted by stirrups, spirals or bent bars, or a combination of these, shall be not less than that given by the following formula:

$$S_1 = \frac{b(v_t + v - v_c)^2}{4v_t}$$

The negative shear to be resisted by the web reinforcement shall be not less than that given by the following formula:

$$S_2 = \frac{b(v_t - v - v_c)^2}{4v_t}$$

where S_1 and S_2 = shear in pounds per inch of length.

Combined Shear and Direct Stress

Par. 6529. When designing a member subjected to a direct stress and a cross shear, the maximum tension, compression and shear shall be considered. The maximum combined stresses shall not exceed the compressive, tensile and shearing stresses specified in Paragraphs 6511, 6512, 6513 and 6514.

SECTION 653

DESIGN REQUIREMENTS FOR REINFORCEMENT

Spacing of Reinforcement

Par. 6530. The clear distance between parallel reinforcing bars in concrete shall be not less than one and one-half times the diameter for round bars, twice the side dimension for square bars, and twice the square root of the cross-sectional area of other bars, except as permitted for specially anchored bars in Paragraph 6548, but in no case shall the clear spacing be less than one inch.

Concrete Protection for Reinforcement

Par. 6531. All reinforcement of footings and other principal structural members in which concrete is deposited against the ground shall have concrete protection of not less than 3 inches from the ground contact surface. At other surfaces, where concrete may be exposed to the ground or weather, but has been placed in forms, the principal reinforcement shall have concrete protection of not less than 2 inches. The protective covering for principal reinforcement in concrete not exposed directly to the ground or weather shall be not less than three-quarters of an inch for slabs, joist construction with fillers, and walls, and one and one-half inches for beams, girders and columns. For stirrups, ties, temperature and similar reinforcement, except in footings, the covering may be reduced by the diameter of such reinforcement, but the protection shall never be less than three-quarters of an inch. The protection of all reinforcement in concrete exposed to fresh water in tanks, reservoirs and similar structures shall be not less than one and one-half inches for slabs and two inches for beams, girders and columns. The concrete protection shall in no case be less than the diameter of round bars or one and one-half times the side of square bars. The concrete protection shall be taken as the clear distance between the face of the reinforcement and the surface of the concrete.

For the protection of reinforcement in fire-resistive construction, refer to Chapter 59.

Ordinary Anchorage for Reinforcement

Par. 6532. Every tensile reinforcing bar shall be extended at least 12 diameters beyond the point at which it is no longer needed to resist stress. In cases where the length, so obtained, from the point of maximum tensile stress in the bar to the end of the bar is not sufficient to develop this maximum stress by bond, the bar shall extend into a region of compression and be anchored by means of a standard hook or it shall be bent across the web at an angle of not less than 15 degrees with the longitudinal portion of the bar and either made continuous with the positive reinforcement or anchored in a region of compression.

Tensile negative reinforcement in any span of a continuous, restrained, or cantilever beam, or in any member of a rigid frame shall be anchored by bond, hooks or mechanical anchors in or through the supporting member.

Of the positive reinforcement in continuous beams not less than one-fourth the area shall extend along the same face of the beam into the support a distance of ten or more bar diameters, or shall be extended as far as possible into the support and terminated in standard hooks.

In simple beams, or at the outer ends of freely supported end spans of continuous beams, at least one-half the positive reinforcement shall extend along the same face of the beam into the support a distance of ten or more bar diameters, or shall be extended as far as possible into the support and terminated in standard hooks.

Special Anchorage for Reinforcement

Par. 6533. Where increased shearing or bond stresses are permitted in Paragraphs 6511 and 6513 because of the use of special anchorage, every bar shall be terminated in a standard hook, or it shall be bent across the web at an angle of not less than 15 degrees with the longitudinal portion of the bar and made continuous with the negative or positive reinforcements or it may be simply an extension of the bar.

Hooks

Par. 6534. The term "hook" or "standard hook" as used herein shall mean a complete semi-circular turn with a radius of bend on the axis of the bar of not less than 3 and not more than 6 bar diameters, plus an extension of at least 4 bar diameters at the free end of the bar. Hooks having a radius of bend of more than 6 bar diameters shall be considered merely as extensions to the bars.

Hooks shall not be assumed to carry a load which would produce a tensile stress in the bar greater than 10,000 pounds per square inch.

Any mechanical device capable of developing the strength of the bar without damage to the concrete may be used in lieu of a hook if tests are presented to show the adequacy of such devices, and the approval of the Buildings Engineer is obtained.

Types of Web Reinforcement

Par. 6535. The web reinforcement of concrete beams and girders shall be of any of the following types or the combination thereof:

Stirrups or single bars, perpendicular or at an angle to the longitudinal reinforcement.

Longitudinal bars bent up at an angle to the longitudinal reinforcement.

Special arrangements of bars approved by the Buildings Engineer with adequate provisions to prevent the slip of bars or splitting of the concrete.

Design of Web Reinforcement.

Par. 6536. Stirrups or single bars used as web reinforcement for beams or girders shall form an angle of at least 30 degrees with the longitudinal reinforcement.

Bent up bars shall form an angle of not less than 15 degrees with the longitudinal reinforcement.

The web reinforcement to be considered effective shall be anchored as required in Paragraph 6539.

The method used to compute the amount of web reinforcement when special arrangements of bars are employed shall be determined by making comparative tests, to destruction, of specimens of the proposed system and of similar specimens reinforced with stirrups, single, or bent up bars, the same factor of safety being applied in both cases.

Spacing of Web Reinforcement

Par. 6537. The maximum spacing of web reinforcement, where required, shall be as follows:

Stirrups, vertical or inclined, and bent up bars, inclined at not less than 45 degrees, 2/3d.

Bent up bars, inclined at less than 45 degrees, 2/3 of horizontal projection of the inclined portion.

Where the shearing stress, v, is in excess of $0.06f'_c$, the above proportions shall be reduced to ½d.

Combined Web Reinforcement

Par. 6538. Where more than one type of reinforcement is used to reinforce the same portion of the web, the total shearing resistance of this portion of the web shall be assumed as the sum of the shearing resistances computed for the various types separately. In such computations the shearing resistance of the concrete shall be included only once.

Anchorage of Web Reinforcement

Par. 6539. Single bars used as web reinforcement shall be anchored at each end by one of the following methods:

a. Welding to longitudinal reinforcement.

b. Hooking tightly around longitudinal reinforcement through at least 180 degrees.

c. Embedment in the compression area of the members a distance sufficient to develop the tensile stress in the bars by bond.

The free ends of U shaped or multiple stirrups shall be anchored as follows:

d. By a method described under a, b or c.

e. By bending through at least 90 degrees tightly around a longitudinal bar and projecting beyond the bend at least 12 diameters of the stirrup.

The loops of U shaped or multiple stirrups shall be anchored as follows:

f. By bending around longitudinal reinforcement through at least 90 degrees.

g. By welding to the longitudinal reinforcement.

Longitudinal bars bent to act as web reinforcement shall, in the region of tension, be continuous with the longitudinal reinforcement. The ends of such bars in the region of compression shall be anchored by one of the following methods:

h. As described under c.

i. Partly by bond and partly by a bend with a radius of not less than $2d_1$ plus an extension of at least $12d_1$ parallel to the upper or lower surface of the member, ending in a standard hook.

j. Partly by bond and partly by a bend with a radius of not less than $2d_1$ and continuity with the compression reinforcement.

In i and j the short radius bend plus the extension with standard hook or plus the continuity with the compression reinforcement shall be assumed to develop not more than 10,000 pounds per square inch tensile stress of the bar.

In all cases, web reinforcement shall be carried as close to the compression surface of the beam as fireproofing regulations and the proximity of other steel will permit.

"d_1" is the diameter of round bars or the square root of the cross-sectional area of other bars.

SECTION 654

CONCRETE SLAB, BEAM AND GIRDER DESIGN

Thickness and Support of Concrete Slabs

Par. 6540. All solid concrete slabs, except in ribbed and other special floors, shall have a thickness of not less than 3 inches for roofs and 3½ inches for floors. Any floor finish not placed monolithically with the floor slab shall not be included as a part of the structural member.

The thickness of a solid slab reinforced in 2 directions and supported on 4 sides shall be not less than that computed from the following formula, but never less than 4 inches:

$$t_3 = 0.166\left(S+\frac{S}{m}-0.10N\right)\sqrt[3]{\frac{2500}{f'_c}}$$

where S is defined in Paragraph 6542, t_3 is the total thickness of the slab in inches and N is the sum of the lengths in feet of those edges of the panel which support adjacent continuous spans.

For thickness of slabs in ribbed construction, refer to Paragraph 6596.

Reinforced concrete slabs supported on masonry walls shall have a support at least equal to half of the effective depth of the slab, but in no case less than 4 inches.

Design Coefficients for Reinforced Concrete Beams and Slabs

Par. 6541. The use of the design coefficients given herein shall be limited to slabs or beams, or a series of continuous slabs or beams intended to support partial or total uniform loads with spans differing by not more than 25 per cent of the adjacent longer span.

The coefficients of wl^2 to be used to compute the bending moment at mid-spans and at the supports for the specified condition of restraint at the extreme end supports, irrespective of the condition of restraint of the intermediate supports, shall be as shown in the following table:

TABLE 6541T

Condition of Restraint at End Supports	Number of Spans	End Spans		Interior Spans		
		Exterior Support	Mid-Span	First Interior Support	Other Supports	Mid-Span
DEAD LOAD						
Negligible......	1	—.040	.125	....	....	....
	2	—.040	.075	—.125	....	....
	3 or more	—.040	.080	—.110	—.075	.062
Moderate.......	1	—.062	.095	....	....	....
	2	—.062	.070	—.105	....	....
	3 or more	—.062	.070	—.100	—.080	.062
Full...........	1	—.085	.062	....	....	....
	2	—.085	.062	—.085	....	....
	3 or more	—.085	.062	—.085	—.085	.062
LIVE LOAD						
Negligible......	1	—.040	.125	....	....	....
	2	—.040	.100 —.040	—.125	....	....
	3 or more	—.040	.100	—.125	—.110	.080 —.040
Moderate.......	1	—.062	.105	....	....	....
	2	—.072	.092	—.105	....	....
	3 or more	—.080	.092	—.110	—.110	.080 —.040
Full...........	1	—.085	.085	....	....	....
	2	—.105	.085	—.085	....	....
	3 or more	—.115	.085	—.100	—.105	.080 —.040

The coefficients of wl to be used to compute the shear shall be taken as 0.625 at first interior supports, 0.60 at all other interior supports and at fixed ends, 0.50 at free ends, and 0.15 at mid-spans.

Slabs shall be considered negligibly restrained when their ends are free to move or have ordinary supports on walls of masonry units.

Beams shall be considered negligibly restrained when their ends are free to move or are supported by beams, girders, or walls of masonry units.

Slabs shall be considered fully restrained when they are rigidly connected to concrete walls, and beams shall be considered similarly restrained if framed rigidly into reinforced concrete columns or walls, and if the $\frac{I}{l}$ of the beams or slabs is less than twice the sum of the values of $\frac{I}{H}$ for the columns or walls, respectively, above and below.

Slabs shall be considered moderately restrained when they are poured monolithically with reinforced concrete beams or steel beams encased in concrete, and beams shall be considered similarly restrained when they are framed into composite columns. Slabs and beams shall also be considered moderately restrained if they are framed as required for the fully restrained condition, and if their $\frac{I}{l}$ is equal to or greater than twice the sum of the values of $\frac{I}{H}$ for the columns or walls, respectively, above and below.

The span length l shall be determined as required in Paragraph 6504, except that where beams are framed rigidly into the supporting members the clear span may be used.

In calculating the negative bending moment at a support between two spans of unequal lengths, an assumed span, which shall be two-thirds the longer span plus one-third the shorter, shall be used.

In calculating the negative bending moment at a support between two spans of unequal loading, the average unit load over the two spans shall be taken.

Design of Slabs Supported on Four Sides

Par. 6542. The regulations in this Paragraph apply to rectangular solid concrete slabs, or ribbed slabs constructed in accordance with Paragraph 6597, with uniform loads, and supported on four sides by beams or walls, in either case built monolithically with the slabs. The regulations shall also apply to slabs consisting of a single panel, and built into masonry walls, if the weight of the masonry above the slab is sufficient to restrain the slab at the edges.

Such structures shall be so designed that they will be at least equal in strength to those designed by the methods described herein and in Paragraph 6543.

For the purpose of design each panel is divided into a middle strip and two column strips as defined for flat slabs in Paragraph 6551.

The method of design is based on moment coefficients shown in Table 6542T, which coefficients, when multiplied by w_1S^2, will give the moments in foot-pounds per one foot of width of the middle strip at the critical sections. For the column strips, the corresponding coefficients are two-thirds of those shown in Table 6542T. The critical sections for the negative moments are at the faces of the supporting beams or walls, and for the positive moments, along the center lines of the panels. In the factor w_1S^2, w_1 is the total load in pounds per square foot and S the length in feet of the shorter span. All span lengths shall be taken as the center to center distance between supports or as the clear distance between supports plus twice the thickness of the slab, including ribs.

TABLE 6542T

For moments at:	Short Span						Long span, for all values of m
	Values of m						
	1.0	0.9	0.8	0.7	0.6	0.5 or less	
Interior panels							
Continuous edge...	.033	.040	.048	.055	.063	.083	.033
Midspan..........	.025	.030	.036	.041	.047	.062	.025
One edge discontinuous							
Continuous edge...	.041	.048	.055	.062	.069	.085	.041
Discontinuous edge	.021	.024	.027	.031	.035	.042	.021
Midspan..........	.031	.036	.041	.047	.052	.064	.031
Two edges discontinuous							
Continuous edge..	.049	.057	.064	.071	.078	.090	.049
Discontinuous edge	.025	.028	.032	.036	.039	.045	.025
Midspan..........	.037	.043	.048	.054	.059	.068	.037
Three edges discontinuous							
Continuous edge...	.058	.066	.074	.082	.090	.098	.058
Discontinuous edge	.029	.033	.037	.041	.045	.049	.029
Midspan..........	.044	.050	.056	.062	.068	.074	.044
Four edges discontinuous							
Discontinuous edge	.033	.038	.043	.047	.053	.055	.033
Midspan..........	.050	.057	.064	.072	.080	.083	.050

The coefficients in Table 6542T shall be taken as positive for the moment at midspan, and negative for other moments. The values of m are obtained by dividing the length of the short span by that of the long span. For values of m other than those shown in the table interpolated values of the coefficients shall be used.

Where the moments on either side of a support are materially different on account of different span lengths on each side of the support, the unbalanced moment shall be distributed to the two slabs and the supports in proportion to their respective stiffness factor, $\frac{I}{l}$. If the support is a beam, its stiffness factor shall be assumed to be equal to the average of the stiffness factors of the two adjacent slabs, and the beam shall be designed to resist the torsion caused by its share of the unbalanced moment.

All slabs supported on four sides shall be reinforced with bars at the exterior corners, near the top and bottom face of the slab. The effective area at such reinforcement per foot of width in each layer shall be equal to that of the positive reinforcement in the middle strip. The direction for which the effectiveness of the bar is to be determined shall be parallel to the diagonal of the slab at the top, and perpendicular to the diagonal at the bottom.

The computation of the shearing stresses in the slabs shall be based on the load distribution to the supporting members as given in Paragraph 6543.

The minimum thickness of solid slabs shall be as required in Paragraph 6540.

Design of Supports on Four Sides of Slabs

Par. 6543. The supporting beams or walls of slabs supported on four sides shall be so designed that they will be at least equal in strength to those designed by the method given herein.

The loads on such members are assumed to be equal to the total loads in the tributary areas bounded by the intersection of 45-degree lines issuing from the corners with the center line of the panel parallel to the long sides.

The loads so obtained shall be used to compute the bending moments in the supporting beams by accepted methods and for computing the shears therein and in the slab. Where an approximate method of calculating the moments is used, such as described in Paragraph 6541, a unit load obtained by the following formulas shall be assumed:

$$w_l = \frac{w_1 S}{3}\left(\frac{3-m^2}{2}\right)$$

$$w_s = \frac{w_1 S}{3}$$

where w_l and w_s are the loads from one panel, in pounds per lineal foot of length, on the members parallel to the long span and short span respectively, and the other symbols are as defined in Paragraph 6542.

Concentrated Loads on Concrete Slabs

Par. 6544. For computations of stresses due to bending and shear, concentrated loads on slabs shall be permitted to be considered as evenly distributed over a width at right angles to the direction of the span according to the following formula:

$$e = 0.75 + 1.2t + x$$

where:

e—effective width, in feet

t—slab thickness in feet

x—distance from nearest edge of slab in feet but not more than $1+2.4t$.

For ribbed floor construction, concentrated loads shall not be distributed over more than twice the rib spacing unless bridging having the same spacing as the ribs is provided. In the latter case, it may be distributed the same as for solid slabs.

Requirements for T-Beams

Par. 6545. In T-beam construction, the slab and beam shall be built integrally. The effective flange width to be used in the design of symmetrical T-beams shall not exceed one-fourth of the span length of the beam, and its overhanging width on either side of the web shall not exceed 8 times the thickness of the slab nor one-half the clear distance to the next beam.

For beams having a flange on one side only, the effective overhanging flange width shall not exceed one-twelfth of the span length of the beam, nor 6 times the thickness of the slab, nor one-half of the clear distance to the next beam.

The overhanging portion of the flange of the beam shall not be considered as effective in computing the shear and diagonal tension resistance of T beams.

Where the principal reinforcement in a slab, which is considered as the flange of a T-beam, is parallel to such beam, transverse reinforcement in an amount not less than 0.3 per cent of the sectional area of the slab shall be provided in the top of the slab, extending across the beam and into the slab not less than two-thirds of the width of the effective flange overhang.

End and Lateral Supports of Concrete Beams

Par. 6546. Reinforced concrete beams supported on masonry walls shall have at least 6-inch supports.

The clear distance between lateral supports of an isolated beam shall not exceed 36 times the least width of the compression flange or of the side at the compression zone. Where a beam is thus supported, the allowable compressive stress in the concrete shall be reduced 50 per cent, and where the distance between lateral supports is less than 24 times the least width, no reduction of the stress is required. For intermediate ratios of unsupported length to width, proportionate reductions of stress shall be made.

Lateral supports shall comprise slabs or beams designed to carry a load or struts anchored into walls or beams. Struts used as lateral supports shall have a least side dimension or diameter not less than one-thirty-fifth of their length.

Bond Stresses in Slabs, Beams and Girders

Par. 6547. For continuous or restrained members, the critical section for bond for the positive reinforcement shall be assumed to be at the point of inflection, and that for the negative reinforcement shall be assumed to be at the face of the support and at the point of inflection. For simple beams, or at the outer ends of freely supported end spans of continuous beams, the critical section for bond shall be assumed at the face of support.

Principal Reinforcement in Slabs, Beams and Girders

Par. 6548. All compression steel shall be thoroughly anchored by ties or stirrups not less than one-quarter inch in size which shall be spaced not more than 16 bar diameters apart over the distance where the compression steel is required.

At least one-third of the negative reinforcement of slabs and beams designed with the coefficients given in Paragraph 6541 shall extend beyond the center of the intermediate supports, or fixed end supports a distance equal to at least one-third the longer of the contiguous spans. For the negative reinforcement of other beams, refer to Paragraph 6532.

In slabs, beams and girders, splices of reinforcement at points of maximum stress shall generally be avoided. Splices shall provide sufficient lap to transfer the stress between bars by bond and shear, or by mechanical means sufficient to develop the strength of the bar. In such splices the minimum spacing of bars shall be as specified for parallel bars.

Shrinkage and Temperature Reinforcement for Slabs and Beams

Par. 6549. Reinforcement for shrinkage and temperature stresses normal to the principal reinforcement shall be provided in floor and roof slabs where the principal reinforcement extends in one direction only.

SECTION 655

FLAT SLAB SYSTEMS

General Requirements for Flat Slabs

Par. 6550. The term flat slabs as used in these regulations refers to concrete slabs, without beams or girders to carry the load to supporting members, reinforced with bars extending in two or four directions. Slabs with dropped panels or paneled ceilings shall be considered flat slabs if they meet the requirements herein given for such construction.

The moment coefficients, moment distribution, and slab thicknesses specified herein are for a series of rectangular slabs of approximately uniform size arranged in three or more rows of panels in each direction, and in which the ratio of length to width of panel does not exceed 1.33.

For structures having a width of less than three rows of panels, or in which irregular panels are used, an elastic analysis shall be made of the moments developed in both slabs and columns. When so required, computations shall be submitted to the Buildings Engineer for approval.

Panel Strips and Principal Design Sections for Flat Slabs

Par. 6551. A flat slab panel shall be considered for the purpose of design as consisting of strips in each direction as follows:

A middle strip one-half panel in width, symmetrical about panel center line and extending through the panel in the direction in which moments are considered.

A column strip one-half panel in width occupying the two quarter panel areas outside of the middel strip, and extending through the panel in the direction in which moments are considered.

The critical sections for moment calculations are referred to as principal design sections and are located as follows:

Sections for Negative Moment: These shall be taken along the edges of the panel, on lines joining the column centers, except that they follow the perimeter of the column capital instead of passing through it.

Sections for Positive Moment: These shall be taken on the center lines of the panel.

In the four-way system, it shall be assumed that the column strip positive moment is resisted by the direct band; that the column strip negative moment is resisted by the direct band plus the two diagonal bands multiplied by the cosine of the angle between the direct band and the diagonal bands; that the middle strip positive moment is resisted by the two diagonal bands multiplied by the cosine of the angle between the axis of the middle strip and the diagonal bands; and that the middle strip negative moment is resisted by an independent top band across the middle band.

Slab Thickness and Dropped Panel Sizes for Flat Slabs

Par. 6552. The thicknesses of flat slabs shall be not less than those given by the following formula:

$$t_1 \text{ or } t_2 = Cl\sqrt[3]{\frac{2500}{f'_c}}$$

where l is that span length of the panel which will give the greatest t_1 or t_2, and where the values of C are as follows:

0.03 for end spans of floor slabs.
0.026 for interior spans of floor slabs.
0.025 for end spans of roof slabs.
0.023 for interior spans of roof slabs.

The slab thickness, t_0, through a dropped panel shall be not more than $1.50t_2$.

The minimum side or diameter of a dropped panel shall be thirty-five-hundredths of the span parallel to such side or diameter.

"Dropped panel" shall mean the portion of the panel which is thickened throughout an area surrounding the column capital.

Moments to be Used in the Design of Flat Slabs

Par. 6553. The total numerical sum of the positive and negative moments, in foot-pounds, at the principal design sections in the direction of either side of a rectangular interior panel, shall be computed from the formula:

$$Mo = 0.09Wl\left(1-\frac{2c}{3l}\right)^2$$

where W is the total dead and live load, in pounds, uniformly distributed over a single panel area, and c is the diameter, in feet, of the column capital as defined in Paragraph 6557.

The minimum moments to be used in the design of interior flat slabs shall be as given in the following table:

TABLE 6553T1

Strips	Flat Slabs Without Dropped Panels		Flat Slabs With Dropped Panels	
	Negative	Positive	Negative	Positive
Column strip for two-way reinforcement ..	0.46Mo	0.22Mo	0.50Mo	0.20Mo
Middle strip for two-way reinforcement ..	0.16Mo	0.16Mo	0.15Mo	0.15Mo
Column strip for four-way reinforcement ..	0.50Mo	0.20Mo	0.54Mo	0.19Mo
Middle strip for four-way reinforcement ..	0.10Mo	0.20Mo	0.08Mo	0.19Mo

The minimum moments to be used in the design of the strips perpendicular to the discontinuous edge of an exterior panel, which is supported by a marginal beam framed into columns of adequate rigidity, shall be as shown in the following table: (See note)

TABLE 6553T2

Strips	Flat Slabs Without Dropped Panels			Flat Slabs With Dropped Panels		
	Negative at discontinuous edge	Positive at mid-span	Negative at first interior column line	Negative at discontinuous edge	Positive at mid-span	Negative at first interior column line
Column strip for two-way reinforcement	0.368Mo	0.253Mo	0.530Mo	0.400Mo	0.230Mo	0.575Mo
Middle strip for two-way reinforcement	0.128Mo	0.208Mo	0.208Mo	0.120Mo	0.195Mo	0.195Mo
Column strip for four-way reinforcement	0.400Mo	0.230Mo	0.575Mo	0.432Mo	0.218Mo	0.620Mo
Middle strip for four-way reinforcement	0.080Mo	0.260Mo	0.130Mo	0.064Mo	0.247Mo	0.104Mo

Note: A column, or two columns, one above the other, having an average stiffness factor, $\frac{I}{h}$, at least equal to one-and-one-half times the stiffness factor, $\frac{I}{l}$, of the slab, shall be considered to have adequate rigidity. The I of the slab with dropped panel shall be computed on the basis of a depth equal to the slab thickness plus one-third of the drop and of a width equal to the column spacing.

All moments at the principal design sections of an exterior panel not given in the above table shall be as required for interior panels, except that the half column strip adjacent and parallel to a marginal beam with a depth greater than one and one-half times the slab thickness or to a bearing wall, may be designed for 25 per cent of the moments required for a whole column strip in interior panels.

Where there is a beam with a depth more than one and one-half times greater than the slab thickness, or a bearing wall at the center line of the columns between two interior panels, the negative moment of the middle strip at the wall or beam line shall be taken to be 30 per cent more than that required for interior panels. The column strip adjacent and parallel to such beam or wall may be designed for moments 50 per cent less than those required for interior panels.

Length of Reinforcement and Points of Bend

Par. 6554. The positive-moment reinforcement perpendicular to the discontinuous edge shall extend to this edge and have an embedment of at least 6 inches in marginal beams or columns. All negative-moment reinforcement shall be bent or hooked at marginal beams or columns to provide adequate bond resistance. Overall length of bars and points of bend, in feet, shall be as given in the following table. Proper allowances for the bends shall be added to all bent bars.

TABLE 6554T

Strips or Bands	With Drop Panel	Without Drop Panel
Column Strip:		
Length of straight bars	$l—b_1+(40d_0$ or 2 ft.$)$	$.75l$
Length of bent bars....	$1.5l+0.6c$	$1.5l+0.6c$
Length of additional bars	$0.5l+0.6c$	$0.5l+0.6c$
Distance of point of top bend in bent bars from column center:		
In two-way slabs..	$0.25l$	$0.25l$
In four-way slabs .	$0.2l$	$0.2l$
Middle Strip:		
Length of straight bars	$0.65l$	$0.7l$
Length of bent bars....	$1.5l$	$1.5l$
Distance of point of top bend in bent bars from column center..	$0.175l$	$0.15l$
Diagonal Band: (See note)		
Length of straight bars	$l—b_1+(40d_0$ or 2 ft.$)$	$0.75l$
Length of bent bars....	$2.2l$	$2.2l$
Distance of point of bend in bent bars from column center..	$0.33l$	$0.33l$
Length of additional straight bars over column head	$0.8l$	$0.8l$
Length of straight bars placed across middle of direct band.......	$0.5l$	$0.5l$

In the above table, b_1 shall be taken in the direction of the reinforcement. The dimension d_o is the diameter, in feet, of a round bar, or the square root of the area of a square or rectangular bar. For diagonal reinforcement of rectangular panels, l shall be taken as the average of two spans, and b_1 as the average of the two dimensions of the dropped panel.

Note: "Diagonal band" shall mean a group of bars symmetrical with respect and parallel to the diagonal running from corner to corner of the panel.

"Direct band" shall mean a group of bars running parallel with the panel sides.

Arrangement of Reinforcement in Flat Slabs

Par. 6555. In the column strips of two-way and four-way systems, at least four-tenths of the reinforcement required for the positive moment shall be bent up and carried over the column heads, and not less than four-tenths of the reinforcement of the column strips shall be straight bars.

In the middle strips not less than four-tenths of the reforcement required for the positive moment shall be bent up and extended over the column strips, and at least half of such reinforcement shall be straight bars.

In diagonal strips not less than four-tenths of the reinforcement required for the positive moment shall be bent up and carried over the column heads.

Slab reinforcement shall be securely anchored and supported on concrete or metal chairs and spacers.

Compressive and Shearing Stresses in Flat Slabs

Par. 6556. The computed compressive stresses in the concrete of flat slabs shall be not less than those obtained from the following formulas, but the stress so computed shall not exceed 0.45 f_c:

At the column line of the column strip, with dropped panel:

$$f_c = \frac{3\left(1 - 1.2\frac{c}{l}\right)M_1}{jkb_1d^2}$$

At the column line of the column strip, without dropped panel:

$$f_c = \frac{6\left(1 - 1.2\frac{c}{l}\right)M_1}{l_1d^2jk}$$

At mid-section of column or middle strip:

$$f_c = \frac{6M_2}{jkl_1d^2}$$

At column line of middle strip:

$$f_c = \frac{6M_3}{jkl_1d^2}$$

In the above formulas, M_1 is the negative moment in two column strips of flat slab in foot-pounds, M_2 is the positive moment in two column strips or a middle strip of a flat slab in foot-pounds, and M_3 is the negative moment in a middle strip of a flat slab in foot-pounds. The dimensions b_1 shall be taken perpendicularly to the span considered.

The shearing stresses in flat slabs shall be determined at a section concentric with the column capital and lying at a distance of t_1 minus 1½ inches or t_0 minus 1½ inches beyond the capital, and at sections parallel to the edges of the dropped panel, lying at a distance of t_2 minus 1½ inches therefrom.

The effective depth, d, used for computing compressive and shearing stresses shall be taken as t_1 minus 1½ inches, t_0 minus 1½ inches or t_2 minus 1½ inches.

Column Capital Sizes and Brackets

Par. 6557. The effective diameter, c, of the column capital, of a flat slab shall be taken as the base diameter of the largest right circular cone which lies entirely within the capital whose vertex angle is 90 degrees and whose base is one and one-half inches below the bottom of the slab or the dropped panel.

Brackets on exterior columns may be substituted for capitals, provided the sloping face makes an angle of not more than 45 degrees with the face of the column, and it is not less in width than the column. The value of c where brackets are used is twice the distance from the center of the column to a point where the bracket is one and one-half inches thick.

Beams in Flat Slab Design

Par. 6558. All beams having a depth greater than one and one-half times the slab thickness at the discontinuous edges of and within flat slabs shall be designed for a load equal to one-quarter of the adjacent total panel load plus any other loads directly superimposed on them. Beams with a depth one and one-half times the slab thickness or less shall be designed only for the loads superimposed upon them.

When the thickness of the column strip parallel to a discontinuous edge exceeds the thickness of the dropped panel, it shall be considered as a marginal beam.

Openings in Flat Slabs

Par. 6559. Openings of any size may be cut through the floor, provided the total positive and negative resisting moments of the discontinued reinforcement and concrete are maintained by distributing these total positive and negative moments between the remaining portions.

SECTION 656

REINFORCED CONCRETE COLUMN AND WALL DESIGN

Limiting Dimensions of Concrete Columns

Par. 6561. The following Paragraphs relative to reinforced concrete columns, except Paragraphs 6565, shall apply to columns in which the unsupported length is not greater than 10 times the least lateral dimension or diameter. When the unsupported length exceeds this value, the design shall be modified as shown in Paragraph 6565. Principal columns in buildings shall have a minimum diameter or thickness of 10 inches and a minimum gross area of 120 square inches.

Unsupported Length of Concrete Columns

Par. 6562. For purposes of determining the limiting dimensions of columns, the unsupported length of reinforced concrete columns shall be taken as the clear distance between floor slabs, except that:

In flat slab construction, it shall be the clear distance between the floor and the lower extremity of the capital.

In beam and slab construction, it shall be the clear distance between the floor and the under side of the deeper beam framing into the column, at the next higher floor level, in the direction for which the height is to be determined.

In columns restrained laterally by beams with haunches used at the junction, the unsupported length shall be the clear distance between the floor and the lower edge of the haunch, provided that the haunch width equals that of the beam or strut and is at least half that of the column.

Members restraining columns are only those members which are designed to carry loads or struts anchored into beams or walls. Struts used as lateral supports shall have a least side dimension, or diameter, not less than one-thirty-fifth of their length.

A strut between two columns, neither of which is braced, shall not be considered as a restraining member.

Spiral-Reinforced Columns

Par. 6563. The maximum permissible axial load, P, in pounds, on columns with closely spaced spirals enclosing a circular concrete core reinforced with longitudinal bars shall be that given by the following formula:

$$P = 0.225 f'_c A_g + f_s A_s$$

where $f_s = 20{,}000$ pounds per square inch for hard grade billet steel, rail steel and axle steeel and 16,000 pounds per square inch for intermediate grade steel, and A_s = area of longitudinal steel in square inches.

The area, A_g, of spiral-reinforced columns shall be taken as either the area of a circle having a diameter three inches larger than the outside diameter of the spirals or as a square or rectangle of which the sides are one and one-half inches outside the spiral.

The ratio, p_g, shall be not less than 0.01 nor more than 0.08. The minimum number of bars shall be 6, and the minimum bar diameter shall be five-eights inch. The center to center spacing of bars within the periphery of the column core shall be not less than two and one-half times the diameter for round bars or three times the side dimension for square bars. The clear spacing between bars shall be not less than one and one-half inches or one and one-half times the maximum size of the coarse aggregate used. These spacing rules also apply to adjacent bars at a lapped splice.

The ratio of the volume of spiral reinforcement to the volume of the concrete core, p′, shall be not less than the value given by the following formula, nor shall it be less in any case than 0.0112 for hot rolled spirals of intermediate grade or 0.0075 for cold drawn wire spirals:

$$p' = 0.45(R-1)\frac{f'_c}{f'_u}$$

where f'_u is the useful limit stress of spiral reinforcement, to be taken as 40,000 pounds per square inch for hot rolled rods of intermediate grade, and as 50,000 pounds per square inch for rods of hard grade, of a quality specified by the American Society for Testing Materials Specification, Serial Designation A15-39, and 60,000 pounds per square inch for cold drawn wire of a quality specified by the American Society for Testing Materials Specification, Serial Designation A82-34; and R is the ratio of the gross area of the column to the core area, which is the area within the outer circumference of the spirals.

The spiral reinforcement shall consist of evenly spaced continuous spirals held firmly in place and true to line by at least 3 vertical spacer bars. Anchorage of spiral reinforcement shall be provided by one and one-half extra turns of spiral rod or wire at each end of the spiral unit. Splices, when necessary, shall be made in the spiral rod or wire by welding or by a lap of one and one-half turns. The center to center spacing of the spirals shall not exceed one-sixth of the core diameter. The clear spacing between spirals shall not exceed 3 inches nor be less than one and three-eights inches or one and one-half times the maximum size of the coarse aggregate used. The reinforcing spiral shall extend from the floor level in any story, or from the top of the footing in the basement, to the level of the lowest horizontal reinforcement in the slab, dropped panel or beam above. In a column with a capital, it shall extend to the plane at which the diameter or width of the capital is twice that of the column.

Where lapped splices are used in vertical round reinforcing bars, the lap shall be not less than 24 diameters for deformed bars of intermediate grade steel, and 30 diameters for bars of rail steel and axle steel, and for plain bars, the lap shall be not less than 30 and 38 diameters, respectively. The lap for square or rectangular bars shall be calculated in the same manner by substituting the square root of their area for the diameter in the above regulations.

Welded splices of column reinforcement shall be permitted instead of lapped splices when the bars are butted and welded so as to develop the full stress of the bars. Other butted splices are permitted if the bars have full bearing or are so connected as to develop the full stress.

Where changes in the cross-section of a column occur, the longitudinal bars shall be offset in a region where lateral support is afforded by a concrete capital, floor slab or by metal ties or reinforcing spirals. Where bars are bent in offsets, the slope of the inclined portion from the axis of the column shall not exceed 1 in 6 and the bars above and below the offset shall be parallel to the axis of the column.

Tied Columns

Par. 6564. The maximum permissible axial load on tied columns reinforced with longitudinal bars and separate lateral ties shall be 80 per cent of that given by the formula for spiral-reinforced columns. The ratio, p_g, in tied columns shall not be less than 0.01 nor more than 0.04. The longitudinal reinforcement shall consist of at least 4 bars, of minimum diameter of five-eighths inch. Splices and offsets in reinforcing bars shall be made as described in Paragraph 6563.

Lateral ties shall be at least one-quarter inch in diameter and shall be spaced apart not over 16 longitudinal bar diameters or the least dimension of the column. When there are more than 4 vertical bars, additional ties shall be provided so that every longitudinal bar is held firmly in two directions approximately at right angles to each other.

In a tied column which for architectural reasons has a larger cross-section than required by considerations of loading, a reduced effective area, A_g, not less than one-half of the total area may be used in applying the provisions hereinbefore stated.

Long Reinforced Concrete Columns

Par. 6565. The maximum permissible load P′, in pounds, on axially loaded reinforced concrete columns having a length, H, greater than 10 times the least lateral dimension or diameter shall be that given by the following formula:

$$P' = P\left(1.3-0.03\frac{H}{d_1}\right)$$

where P is the permissible axial load on a short column of the same dimensions and reinforcement and d_1 is the diameter or least lateral dimension of the column, in feet.

Bending Moments in Columns

Par. 6566. The bending moments in the columns of all reinforced concrete structures shall be determined on the basis of loading conditions and restraint and shall be provided for in the design. When the stiffness and strength of the columns are utilized to reduce moments in beams, girders, or slabs, as in the case of rigid frames, or in other forms of continuous construction wherein column moments are unavoidable, such moments shall be provided for in the design. In building frames, particular attention shall be given to cases of unbalanced floor loads on both exterior and interior columns and of eccentric loading due to other causes. Wall columns shall be designed to resist moments produced by the combination of loadings giving the maximum moments.

Resistance to bending moments at any floor level shall be provided for by distributing the moment between the columns immediately above and below the given floor in proportion to their relative stiffness and conditions of restraint.

In reinforced concrete columns subjected to bending moments, the recognized methods of analysis shall be followed in calculating the stresses due to combined axial load and bending.

Permissible Stresses in Eccentrically Loaded Compression Members

Par. 6567. The permissible compressive fiber stress in eccentrically loaded spiral columns and other spiral-reinforced members shall be not more than that given by the following formula:

$$f_c \leqq \frac{0.225f'_c+f_sp_g}{1+(n-1)p_g}\left[\frac{1+\frac{ec}{r^2}}{1+K\frac{ec}{r^2}}\right]$$

where e is the eccentricity, in inches, of the resultant load on the column, measured from the gravity axis; r is the least radius of gyration in inches, of the transformed concrete section; and c is the distance, in inches, of the extreme fiber is compression from the gravity axis; f_s is the nominal compressive stress in the vertical reinforcement as specified in Paragraph 6563 and

$$K=\frac{0.225f'_c+f_sp_g}{1+(n-1)p_g}\times\frac{1}{0.45f'_c}$$

For tied columns and other members, the permissible stress shall be 80 per cent of that given in the above formula.

The permissible tensile stress in the longitudinal reinforcement may equal that specified for flexural members, provided however that splices in the tensile steel at or near the section of maximum column moment are capable of developing fully the yield point strength of the reinforcement.

Design of Monolithic Concrete Walls

Par. 6568. Reinforced concrete bearing walls shall have a thickness of not less than 6 inches.

When the reinforcement in bearing walls is designed, placed and anchored in position as for tied or spiral-reinforced columns, the working stresses and permissible loads shall be on the basis of column formulas in which d_1 shall be taken as the thickness of the wall. In such walls the ratio p_g shall not exceed 0.04. Otherwise, the reinforcement shall be disregarded and the permissible compressive stress on the concrete in bearing walls shall be not more than $0.2f'_c$ for walls having a relation of height to thickness of 10 or less, and for other walls such stress shall be not more than that given by the following formula:

$$f_c \leqq 0.2f'_c\left(1.3-0.03\frac{H}{t}\right)$$

where t is the thickness of the wall in feet.

In the case of concentrated loads, the length of the wall to be considered as effective for each load shall not exceed the center to center distance between loads, nor shall it exceeed the width of the bearing plus 4 times the wall thickness.

Panels and non-bearing walls of reinforced concrete shall have a thickness of not less than 4 inches or one-thirtieth of the distance between the supporting or enclosing members.

Reinforcement for Monolithic Concrete Walls

Par. 6569. Monolithic walls shall be anchored to the floors, columns, pilasters, buttresses and intersecting walls with reinforcement at least equivalent to three-eighths inch round bars 18 inches on centers, for each layer of wall reinforcement.

Monolithic concrete walls shall be reinforced with an area of steel in each direction, both vertical and horizontal, with bars at least equal to 0.0015 (vertically) and 0.0025 (horizontally) times the cross-sectional area of the wall, or with electrically welded wire fabric, 0.0018 times the area. The wire of the welded fabric shall be of not less than No. 10 W.&M. gauge.

Walls more than 8 inches in thickness shall have the reinforcement required for each direction placed in two layers parallel to the faces of the wall. Such layers shall consist of not more than two-thirds of the required reinforcement. In exterior walls at least one-half of the required reinforcement shall be placed near the exterior surface. The reinforcement shall have a minimum protection as required in Paragraph 6531 but shall be placed not farther than one-third the wall thickness from the wall surface.

Bars, if used, shall not be less than the equivalent of three-eighths inch round bars, nor shall they be spaced more than 18 inches on centers. Welded wire reinforcement for walls shall be in flat sheet form.

Sections around openings in monolithic walls shall be reinforced with additional reinforcement equivalent to the area of the bars cut. These bars shall extend 50 diameters beyond the edges of the openings.

SECTION 657

REINFORCED CONCRETE FOOTING DESIGN

Thickness of Reinforced Concrete Footings

Par. 6572. In reinforced concrete footings, the thickness of the footing above the reinforcement at the edge shall not be less than 6 inches for footings on soil, nor less than 12 inches for footings on piles. All footings shall be cast as a unit.

Bending Moments in Footings

Par. 6573. The critical section for bending moment in a concrete footing which supports a concrete column, pedestal or wall, shall be considered to be at the face of the column, pedestal or wall. For footings under masonry walls or piers, the critical section shall be assumed as halfway between the middle and the edge of the wall or pier.

For a round or octagonal concrete column or pedestal, the face of the column or pedestal shall be taken as the side of a square with an area equal to the area enclosed within the perimeter of the column or pedestal.

The bending moment at the critical section in a rectangular footing having a length not greater than one and one-half times its width, supporting a single column or pedestal, shall be computed from the load on trapezoids bounded by the line of the critical section, the corresponding outside edge of the footing and the portions of the two diagonals.

The bending moment at the critical section of such rectangular footing supporting a concentric concrete column or pedestal may be computed from the following formula:

$$M_f = 2w'C^2\ (2L + a)$$

where M_f = bending moment at critical section in inch pounds
a = width of face of column or pedestal in feet
C = projection of footing from the critical section in feet
w' = upward reaction per unit of area of base of footing in pounds per square foot.
L = length of side of footing under consideration in feet.

Where steel or cast iron column bases are used, the moment shall be computed at the middle of the base and the load shall be considered as uniformly distributed over the column or pedestal base.

Other footings shall be designed in accordance with accepted principles of mechanics.

Shearing and Bond Stresses in Footings

Par. 6574. The critical section for shear in footings on foundation soil shall be assumed as a vertical section at a distance d from the face of the column, pedestal or wall supported by the footing.

In footings on piles the critical section for shear shall be assumed at a distance $\frac{d}{2}$ from the face of the column, pedestal or wall. The shear shall be considered to be caused by all piles lying entirely outside of such section.

The critical sections for bond shall be assumed at the face of the column, pedestal or wall, and at vertical planes where changes in depth occur.

Transfer of Stress at Base of Columns

Par. 6575. The compressive stress in longitudinal reinforcement at the base of a column shall be transferred to the pedestal, pier or footing by dowels. There shall be at least one dowel for each column bar, and the total sectional area of the dowels shall be not less than the sectional area of the longitudinal reinforcement in the columns. The dowels shall extend up into the column and down into the pedestal or footing the distance required for lap of longitudinal column bars in Paragraph 6563. However, a hook may be used on dowels to secure this length where it is not practical to use straight bars.

The permissible compressive unit stress in controlled concrete on top of the pedestal, pier or footing directly under the column shall be not greater than $0.375f'_c$ nor greater than that determined by the following formula:

$$r_a = 0.25f'_c \sqrt[3]{\frac{A_o}{A'}}$$

where r_a is the stress in pounds per square inch, A_o is the total area of the top, and A is the loaded area in square feet of the pedestal, pier or footing at the column base.

In sloped or stepped footings, A_o shall be taken as the area of the top horizontal surface of the footing, or as the area of the lower base of the largest frustum of a pyramid or cone contained wholly within the footing and having for its upper base the loaded area A', with side slopes of one vertical to two horizontal.

Where the loaded area is not central on the top of the pedestal, pier or footing, the total area A_o shall be taken as the area of the largest circle that can be drawn about the load as a center and lying entirely within the top of the pedestal, pier or footing.

Spacing of Reinforcement for Footings

Par. 6576. The computed reinforcement for footings shall be spaced over a width equal to the width of the column plus twice the effective depth of the footing plus one-half of the remaining distances to the edge of the footing. In order that no area of the footing shall remain unreinforced, additional bars of the same size shall be placed outside of this effective width, with a spacing not more than twice the distance between the bars of the computed reinforcement.

SECTION 658

DESIGN OF PRECAST REINFORCED CONCRETE

Requirements for Precast Reinforced Concrete

Par. 6580. Precast reinforced concrete members shall be designed as required for other concrete members in this Chapter and, in addition, as required in this section.

Precast concrete members shall be designed for construction stresses as well as for dead and live loads.

Controlled concrete shall be used in all precast reinforced concrete.

All sleeves or openings shall be cast in the concrete at the time of manufacturing and, except for slabs, no drilling or chipping will be permitted on the job.

All precast concrete shall be subject to the approval of the Buildings Engineer.

Precast Concrete Lintels

Par. 6583. Precast concrete lintels, which are detailed so that they can be placed more than one way in the wall, shall be reinforced for any possible condition of loading. All bars shall have standard hooks.

Precast Concrete Floor Joists

Par. 6584. Precast concrete floor joists shall not be used where the live load exceeds 95 pounds per square foot.

Each precast joist shall be reinforced with deformed bars in the upper and lower head, tied together by steel stirrups projecting above the joists to bond with the concrete floor. However, these stirrups need not extend above joists which are manufactured with a serrated top flange, if the serrations are sufficient to fully develop the bond stress between the joist and the slab. All longitudinal steel shall be hooked at the ends.

Precast floor joists with spans of 20 feet or more shall be provided with solid bridging, spaced not over 10 feet apart.

Precast Concrete Slabs

Par. 6585. Precast concrete slabs, the strength of which cannot be determined by the application of accepted formulas, shall be permitted to carry a uniformly distributed load equal to one-fourth of the total load that caused the failure of a full-size panel with the load applied along the two sides, placed one-fourth of the span from each support.

Other precast concrete slabs shall be designed as simple slabs.

Precast Concrete Roof Tile

Par. 6588. Precast concrete roof tile acting as a slab shall meet the requirements of Paragraph 6585.

Precast Concrete Ornaments

Par. 6589. Precast concrete wall ornaments shall be applied to the inside face of the forms or set in the framed openings of the structural form work. Positive anchorage into the concrete shall be made by means of rebates, lugs, non-corrodible metal anchors, not less than one-quarter inch thick, or other approved means. The anchorage shall be capable of supporting the weight of the ornament and any load that may be applied directly upon it.

SECTION 659

DESIGN OF SPECIAL REINFORCED CONCRETE STRUCTURES

Design of Reinforced Concrete Chimneys

Par. 6591. The thickness of the walls for reinforced concrete chimneys shall increase uniformly from the top to the base. The minimum thickness at the top exclusive of lining shall be 5 inches for chimneys with inside diameter of less than 12 feet, 6 inches for 12 to 18 feet, and 7 inches for 18 feet or over.

The percentage of vertical reinforcement should be varied from a minimum of 0.30 per cent at the top to approximately 0.75 per cent at the bottom. This steel shall consist of deformed bars spaced not more than 12 inches on centers. The circumferential steel shall consist of not less than three-eighths inch round bars, spaced not more than 10 inches on centers and with a minimum area of 0.33 per cent throughout the height. The vertical bars shall be placed toward the outside of the shell with a clear covering of not less than 2 inches of concrete. The circumferential bars shall be placed outside of and adjacent to the vertical bars. The percentage of steel noted above shall be computed on the gross area of the concrete. The vertical reinforcement shall be anchored to the footing in such a manner that the chimney may be assumed as fixed at the base.

All parts of the chimney shall be designed to resist the most severe combination of dead weight, wind forces and temperature stresses.

The circumferential reinforcement shall resist all of the diagonal tensile stresses and the computed stress therein shall be not less than that obtained from the following formula:

$$f_s = \frac{V}{3.12\,t\,r\,p}$$

where t is the thickness of the shell in inches, r is the average radius of the shell in inches and p is the percentage of the circumferential reinforcement.

The footing slab shall be large enough so that the sum of the moments of the forces resisting overturning about the outside edge of the footing divided by the sum of the moments of the overturning forces about the same edge shall be not less than 1.8.

The footing slab shall be designed so that the pressures due to weight and wind are safely transmitted to the foundation soil or piling without exceeding the allowable loads on such foundations.

All of the regulations of Section 492 shall be complied with insofar as they apply.

Design of Reinforced Concrete Arches

Par. 6592. All arches shall be designed for the most unfavorable combination of the dead load, temperature changes, rib shortening and full or partial live load.

All concrete arches shall have reinforcement at the top and bottom, each group having an area of not less than 0.125 per cent of the largest cross-section of the arch.

Design of Reinforced Concrete Trusses

Par. 6593. In the computation of stresses for reinforced concrete trusses, proper allowances shall be made for bending and secondary stresses.

Compressive members shall be designed as columns.

In tensile members, all the tensile stresses shall be resisted by the reinforcement and the concrete made only sufficient to cover the bars. The spacing of the bars shall be the same as required in Paragraph 6530. All splices shall be made at panel points. Bars shall extend over several panels.

Each joint shall have additional horizontal and vertical reinforcement in the shape of hoops or stirrups to resist secondary stresses. Proper provision shall be made for diagonal tension due to external shear at the end panel points.

Complete stress analysis of all reinforced concrete trusses shall be submitted with the application.

Design of Reinforced Concrete Tanks

Par. 6594. Reinforced concrete tanks shall be designed for a combination of internal and external pressures, but in no case for less than either the internal or external pressure acting alone. The design shall also provide for stresses due to the shrinkage of concrete in setting. Due consideration shall be given to the type of fixity between the walls and the base of the tank.

Concrete used for tanks shall be controlled concrete. The allowable stress for tensile reinforcement shall not exceed 12,000 pounds per square inch, except where the steel and concrete are pre-stressed, in which case the stresses permitted in Section 651 may be used.

One-Way Concrete Ribbed Floor Construction

Par. 6596. Ribbed floor shall mean a construction consisting of concrete ribs and slabs placed monolithically with or without burned clay or concrete tile fillers.

When burned clay or concrete tile fillers, of a material having a unit compressive strength at least equal to that of the desired strength of the concrete in the ribs, are used, and the fillers are so placed that the joints in alternate rows are staggered, the shells of the fillers in contact with the ribs may be included in the calculations involving shear. No other portion of the fillers shall be included in the design calculations.

Where the slab contains conduits or pipes, the thickness shall not be less than one inch plus the total over-all depth of such conduits or pipes at any point. Such conduits or pipes shall be so located as not to impair the strength of the construction.

The protection for reinforcement in ribs shall meet the requirements for slabs as specified in Paragraph 6531.

One-way ribbed construction shall be designed as required for beams and slabs.

Two-Way Concrete Ribbed Construction

Par. 6597. When burned clay or concrete tile fillers of a material having a compressive strength at least equal to that of the concrete in the ribs are used in two-way ribbed slabs, the shells in contact with the concrete ribs may be considered to resist shear, and the top and bottom shells may be considered to resist bending moments. No other portions of the filler shall be included in the design calculations.

Two-way ribbed construction shall be designed using the formulas given in Paragraphs 6542 and 6543.

Special Systems of Reinforced Concrete

Par. 6599. The sponsor of any system of reinforced concrete which has been in successful use, or the adequacy of which has been shown by test, and the design of which is not covered by this Code, shall have the right to present the data on which the design is based to the Buildings Engineer for his approval.

CHAPTER 66

PROPORTIONING, MIXING AND PLACING CONCRETE

Sec. 661—Controlled Concrete.
Sec. 662—Ordinary Concrete.
Sec. 663—Mixing Concrete.
Sec. 664—Transporting Ready-Mixed Concrete.
Sec. 665—Form Work.
Sec. 666—Placing Metal Reinforcement.
Sec. 667—Placing Concrete.
Sec. 668—Curing Concrete.
Sec. 669—Inspection, Tests and Supervision of Concrete Work.

SECTION 661

CONTROLLED CONCRETE

Scope and Use of Controlled Concrete

Par. 6610. Controlled concrete shall include only such concrete whose mix proportions and ultimate strength have been established for the various purposes noted on the plans prior to the beginning of construction.

Controlled concrete only shall be used for all ready mixed concrete for structural purposes and for walls, and as required in Paragraphs 6580 and 6594.

Proportions for Controlled Concrete

Par. 6611. The proportions of water, cement and aggregates for controlled concrete shall be such as to produce concrete in accordance with the design specifications, and that will work readily into the corners and angles of the forms and around the reinforcement without excessive puddling or spading.

When placed through water, the amount of cement used in a cubic yard of concrete shall be one bag more than the designed amount of cement.

Eestablishing Strength of Controlled Concrete

Par. 6612. The trial tests to establish the strength of controlled concrete shall be made in advance of the construction, using the materials proposed and consistencies specified for the work. The relation between the average 28-day ultimate compressive strength of the concrete or an earlier strength at which the concrete is to receive its full working load, and the water-cement ratio shall be determined by such tests for a range of values including all of the strengths called for on the plans and specifications. The results of 7-day tests may be used instead of the 28-day tests, if the relation between the 7-day and the 28-day strengths is established by tests on concrete of the same mix and materials.

No change or substitutions shall be made in the materials being used on the work without additional tests.

The compression tests shall be conducted as required in Paragraph 6697.

Consistency of Controlled Concrete

Par. 6613. Consistency of controlled concrete shall be such as to meet the following slump requirements:

TABLE 6613T

Type of Structure	Maximum Slump In Inches
Massive sections, pavements, floors laid on ground	4
Heavy slabs, beams or walls	6
Thin walls and columns, ordinary slabs or beams	8

For the method of making slump tests, refer to Paragraph 6695.

Tests for Controlled Concrete

Par. 6615. Controlled concrete shall be tested for compressive strength during the progress of the work at intervals required by the Buildings Engineer, but the number of specimens tested for each different strength of concrete shall be not less than shown in the following table:

TABLE 6615T

Total cubic yards of concrete placed	Number of Test Specimens
100 or less	One for each 50 cubic yards
From 100 to 1000 inclusive	One for each 125 cubic yards
From 1000 to 2000 inclusive	One for each 175 cubic yards
Over 2000	One for each 250 cubic yards

In cases where the strength of the specimen taken from the site of work is less than the specified strength, the Buildings Engineer shall order load tests, as required in Section 606, or tests on hardened concrete, to be made for the portion of the structure affected. Specimens for such tests shall be as required in Paragraph 6698.

The age of the specimens at the time of testing shall be the same as that contemplated for the full-strength concrete at the work, except that where 28-day concrete is used, 7-day old specimens may be tested if the relation between the 7-day and 28-day strength of the concrete is established by additonal tests for the materials and proportions used.

The specimens for the tests shall be made and stored as required in Paragraph 6696 and all compression tests shall be made in accordance with Paragraph 6697.

The expenses of all tests shall be borne by the owner of the structure.

Records for Controlled Concrete

Par. 6616. A record shall be kept by the Supervising Engineer, which record shall cover the quality and quantity of concrete materials, the mixing and placing of the concrete, the placing of the reinforcing steel, and all tests. A complete record shall also be kept of the progress of the work and of the air temperatures, when these fall below 40 degrees Fahrenheit, and of the protection given to the concrete while curing. This record shall be available for inspection by the Buildings Engineer at all times during the progress of the work and shall be preserved by the engineer for two years after the completion of the work.

Where the concrete is mixed at the work, a monthly report embodying the essential data of all the different mixes and other required information shall be submitted to the Buildings Engineer. The form of the report shall be similar to that shown in Paragraph 6646.

Admixtures in Controlled Concrete

Par. 6617. Admixtures which meet the requirements of Section 645 shall be permitted in controlled concrete, as stated in the specifications approved by the Buildings Engineer.

Methods of Measuring Materials for Controlled Concrete

Par. 6618. All cement and aggregates for controlled concrete shall be measured accurately by automatic weighing devices. All water shall be measured accurately by calibrated tanks or by weight.

SECTION 662

ORDINARY CONCRETE

Scope of Ordinary Concrete

Par. 6620. Ordinary concrete shall include all concrete which is not in accordance with the requirements for controlled concrete and is made as required in this Section.

Classification and Use of Ordinary Concrete

Par. 6621. Ordinary concrete is classified into Class A and Class B. Class A shall be permitted in all types of concrete construction, except where controlled concrete is required. Class B shall be permitted only for plain concrete and fill.

Proportions of Ordinary Concrete

Par. 6622. Ordinary concrete shall be proportioned as shown in the following table:

TABLE 6622T

Class	Maximum parts of aggregate to one part of cement by volume	Standard ratio of fine to coarse aggregate by volume	Maximum U. S. gallons of water per bag of cement	Assumed 28-day compressive strength for the standard ratio, pounds per square inch
A	6	2:4	7	2000
B	8	3:5	8	1500

Other than the standard ratio of the fine to the coarse aggregate shall be permitted if the 28-day specimens of the concrete will have a compressive strength of not less than 2000 pounds per square inch for Class A concrete and not less than 1500 pounds per square inch for Class B concrete, if tested as required in Paragraph 6697.

The minimum amount of cement shall be 7 bags to a cubic yard of concrete placed through water and 6 bags to a cubic yard of reinforced concrete subjected to ordinary exposure.

Tests for Ordinary Concrete

Par. 6625. Every job containing more than 100 cubic yards of Class A ordinary concrete shall have at least one specimen tested for each hundred cubic yards or fraction thereof, if so required by the Buildings Engineer. Should the minimum 28-day strength fall below the ultimate strength of 2000 pounds per square inch, the Buildings Engineer shall require a load test under the provisions of Section 606, or a test on the hardened concrete of the parts affected. The specimens for such test shall be as required in Paragraph 6698.

No tests shall be required for Class B concrete.

The expenses of all tests shall be borne by the owner of the structure.

Methods of Measuring Materials for Ordinary Concrete

Par. 6626. All materials for ordinary concrete shall be measured accurately by volume or by weight, provided that the given volume proportions are maintained.

SECTION 663

MIXING CONCRETE

General Requirements for Mixing Concrete

Par. 6630. All concrete shall be mixed until there is a uniform distribution of the materials and shall be discharged completely before the mixer is recharged.

Allowance for Moisture in Aggregates

Par. 6631. When determining the maximum amount of water in ordinary concrete, as restricted in Paragraph 6622, and when establishing the water-cement ratio in controlled concrete, the surface moisture on aggregates and the absorption of very dry aggregates shall be taken into account.

Approximate amounts of surface moisture for fine aggregates, to be assumed when the test required in Paragraph 6467 cannot be made, and for coarse aggregates, shall be as follows:

Very wet sand................	1 gallon per cubic foot
Moderately wet sand..........	½ gallon per cubic foot
Moist sand, gravel or crushed stone...............	¼ gallon per cubic foot

When the tests required in Paragraphs 6465 and 6466 for the absorption of dry aggregates cannot be made, approximate absorption of air dry aggregates shall be assumed to be as follows:

Average sand	1.0 per cent by weight
Pebbles and crushed limestone	1.0 per cent by weight
Trap rock and granite	0.5 per cent by weight
Porous limestone	7.0 per cent by weight

Mixing Equipment

Par. 6632. Stationary mixers, truck mixers and truck agitators shall be built in accordance to the "Concrete Mixer Standards" adopted by the Mixers Manufacturers Bureau of the Association of General Contractors of America. The manufacturer shall attach to each mixer or agitator a metal plate on which is stated the capacities in terms of volume of mixed concrete, and the rate of rotation, for the various uses to which the equipment is applicable. Provisions shall be made on stationary mixers to insure that concrete will not be discharged until the mixing time has elapsed. The truck mixer shall have a batch meter and a locking device capable of preventing the discharge of the mixer prior to the completion of the required number of revolutions. The truck agitator shall have a counting device which can be read both at the proportioning or central plant and at the job site.

Capacity of Mixing Equipment

Par. 6633. The capacities of mixers shall not exceed the manufacturers' rating and the following:

For complete mixing, top-door-loading stationary or truck mixers, 50 per cent and end door loading mixers, 57 per cent of the gross volume of the drum.

For truck mixer, when concrete is partially mixed in a stationary mixer and then loaded into the mixer for completion, two-thirds of the gross volume of the drum.

For truck mixers or agitators, used only for agitating, 80 per cent of the gross volume of the drum.

Mixing Speeds

Par. 6634. The mixing speed shall be at the rate recommended by the manufacturer of the mixer, but not less than four revolutions per minute of the drum nor greater than a speed resulting in a peripheral velocity of the drum of 225 feet per minute.

The agitating speed shall be not less than two nor more than six revolutions per minute of the drum.

Time of Mixing

Par. 6635. When the stationary mixer is depended on for complete concrete mixing, either at the central plant or on the job, the minimum time for mixing shall be not less than one minute for a mixer of one cubic yard capacity or less, and shall be increased 30 seconds for each additional cubic yard capacity or fraction thereof.

When a truck agitator with adequate mixing blades is used to transport the concrete, the mixing time at the central plant may be reduced to one minute and the batch of concrete shall be mixed in the agitator for at least 50 and not more than 150 revolutions.

Each batch of truck mixed concrete shall be mixed not less than 50 nor more than 150 revolutions.

The mixing time shall be measured from the time the cement is placed in the mixer.

Time of Adding Water

Par. 6636. The water shall be added to the concrete aggregate in the mixer at the same time the cement is added.

Central Mixing and Proportioning Plants

Par. 6637. All central mixing and proportioning plants shall be equipped with automatic weighing devices for measuring cement and aggregates, and calibrated tanks for measuring water.

Hand Mixed Concrete

Par. 6638. The same precautions shall be taken with hand mixed concrete as with machine mixed concrete. Materials shall be carefully measured and spread in uniform layers on a water-tight platform; they shall be thoroughly mixed dry by turning three times with a square pointed shovel; water shall be added to obtain the required consistency; the mass shall be turned four times wet, and the mixture placed without delay.

Controlled concrete shall not be hand mixed.

SECTION 664

TRANSPORTING READY MIXED CONCRETE

Scope of Transporting Ready Mixed Concrete

Par. 6640. Scope of transporting ready mixed concrete covers all operations that take place from the time concrete leaves the plant mixer until it is poured in place. It does not cover conveying of concrete mixed on the job, which is regulated in Paragraph 6676.

The term "ready mixed concrete" is used to define concrete mixed in a separate plant or in transit and transported to a project ready for use.

Equipment for Transporting Ready Mixed Concrete

Par. 6641. Concrete shall be transported in constant revolving water-tight containers in which segregation will not take place and from which the concrete can be freely discharged, so that it may be delivered to the work at the specified consistency.

Cleaning of Transporting Equipment

Par. 6642. All transporting equipment for ready mixed concrete shall be washed clean and, before being recharged, all hardened concrete shall be removed.

Time of Transporting Ready Mixed Concrete

Par. 6643. Ready mixed concrete shall be transported to the site of the work and completely poured in place within a period of one hour after the introduction of the cement to the aggregate, but in no case shall the time of transporting ready mixed concrete exceed one-half the time of the initial set, as determined by certified tests, of the cement used in the mix.

Inspection Certificate Required

Par. 6645. An inspection certificate shall accompany each load of ready mixed concrete. This certificate shall be signed by the plant inspector and the job inspector. The plant inspector shall file the certificate so that it will be accessible to the Buildings Engineer at all times for examination.

Form of Inspection Certificate

Par. 6646.

Concrete Supplied by:
Name of Structure:
Location:
Proportion of Mix: Kind: Quantity:
Cement. . . . . .lbs.
Fine Aggregate . . . . .lbs.
Coarse Aggregate . . . . .lbs.
Admixture. . . . . .lbs. or gal.
Water. . . . . .lbs. or gal.
Quantity of Concrete:
Slump of Concrete:
Design Strength of Concrete:
Temperature of Concrete at Site:
Temperature of Atmosphere:
Time of Initial Set of Cement:
Time Cement was added to mix:
Time of Mixing at Central Plant:
Time of Placing Concrete:
Signature of Inspection Company's Representative:
Signature of Job Inspector:

Buildings Engineer's Option Regarding Ready Mixed Concrete

Par. 6647. Ready mixed concrete may be used if it meets with the requirements of this Code and if it does not adversely affect the safety of the construction of any building or other structure.

SECTION 665

FORM WORK

Design of Forms

Par. 6651. Forms shall conform to the shape, lines, and dimensions of the members as called for on the plans, and shall be substantial and sufficiently tight to prevent leakage of mortar. They shall be properly braced or tied together so as to maintain their position and shape.

Forms shall be designed to withstand a hydrostatic pressure equal to that exerted by a liquid weighing 150 pounds per cubic foot.

An opening shall be left in the bottom of all walls and column forms for cleaning the forms and adjusting the steel.

Allowable Working Stresses for Form Construction

Par. 6652. The allowable working stresses for wood and metal, as given in Chapters 62 and 63, may be increased 50 per cent when used in form construction.

Forms for Concrete Containing High Alumina Cement

Par. 6653. All forms for concrete containing high alumina cement shall be of metal.

Removal of Forms

Par. 6654. Forms for concrete shall be removed in such a manner as to insure the complete safety of the structure. When the structure as a whole is supported on shores, the removable floor forms, beam and girder sides, column and similar vertical forms may be removed after 24 hours, providing the concrete is sufficiently hard so as not to be injured thereby. In no case shall the supporting forms or shoring be removed until the members have acquired sufficient strength to support safely their weight and the load thereon.

SECTION 666

PLACING METAL REINFORCEMENT

Scope of Placing Metal Reinforcement

Par. 6660. This Section covers the general requirements for placing, cleaning and bending of reinforcement, and the placing of pipes and conduits in concrete.

Requirements for Placing Reinforcement

Par. 6661. Metal reinforcement shall be accurately placed and adequately secured in position by concrete or metal chairs and spacers in accordance with the approved plans and specifications.

Cleaning and Bending Reinforcement

Par. 6662. Metal reinforcement, at the time concrete is placed, shall be free from loose rust scales or other coatings that will destroy or reduce the bond. Bends shall be made in accordance with the approved drawings.

Pipes and Conduits in Concrete

Par. 6663. All pipes or conduits embedded but not merely passing through floors, walls, beams or other structural concrete shall be spaced not closer than 3 diameters on centers and their outside diameter shall not be larger than one-third the thickness of the slab, beam or wall, except where specifically provided for in the design.

All pipes containing gas, vapor or liquids shall not be embedded in structural concrete.

Pipes, sleeves and conduits merely passing through beams, slabs, walls, columns or other structural concrete shall be permitted to be considered as replacing structurally the displaced concrete provided that the portions in the concrete are of uncoated iron or steel, at least of standard wrought-iron pipe weight, not over 2 inches of nominal diameter, and are spaced not less than 3 diameters on centers, or if specifically calculated to take the stresses of the replaced concrete.

Circular uncoated or galvanized electric conduits of steel or iron embedded in beams, slabs and walls shall be permitted to replace the displaced concrete, if placed as permitted in this Paragraph.

Pipes and conduits embedded in columns shall be permitted to replace the displaced concrete if their cross-sectional area does not exceed 4 per cent of the required concrete area, and if placed as permitted in this Paragraph.

All sleeves or pipes which are to be embedded in concrete or pass through concrete structures shall be shown on the approved drawings.

SECTION 667

PLACING CONCRETE

Scope of Placing Concrete

Par. 6670. The scope of placing concrete covers preparation for placing concrete; methods of conveying concrete, temperature at the time of placing and the temperature of the concrete being placed, bonding of set concrete and freshly poured concrete, and removing of water from fresh concrete.

Preparation for Placing Concrete

Par. 6671. Before placing concrete, all equipment for conveying the concrete shall be cleaned. All debris and ice shall be removed from the places to be occupied by the concrete.

Water shall be removed from excavations before concrete is deposited, unless otherwise permitted by the Buildings Engineer. Water flowing into an excavation shall be diverted through proper side drains to a sump, or be removed by other approved methods which will avoid washing the freshly deposited concrete.

Controlled concrete shall not be placed until the forms and reinforcement have been inspected by the person responsible for the design or his authorized representative.

Requirements for Placing Concrete

Par. 6672. Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to rehandling or flowing. No concrete that has partially hardened or which has been contaminated by foreign material shall be deposited on the work, nor shall retempered concrete be used.

When depositing of the concrete is once started, it shall be carried on as a continuous operation until the placing of the panel or section is completed. When construction joints are necessary, they shall be made in accordance with Paragraph 6678.

All concrete shall be thoroughly compacted by tamping, vibrating or spading each layer during the operation of placing, and shall be thoroughly worked around reinforcement, embedded fixtures and into the corners of the forms.

Where conditions make compacting difficult, or where the reinforcement is congested, batches of mortar containing the same proportions of cement to sand as used in the concrete, shall first be deposited in the forms. The concreting shall be carried on at such a rate that the concrete is at all times plastic and flows readily into the spaces between the bars.

Placing Concrete In Water

Par. 6673. Where conditions are such that concrete must be placed through water, it shall be placed by the tremie method, with drop bottom buckets, with bags, or any other method approved by the Buildings Engineer.

The tremie shall be water-tight and large enough to permit the free flow of concrete. The lower end of the tremie shall be kept continually submerged in concrete, and the seal shall not be broken. Should the charge be lost during placing of concrete, the tremie shall be completely withdrawn and refilled.

The drop bottom buckets shall be of a type that cannot be dumped until it rests on the surface upon which the concrete is to be deposited. The bucket shall be completely filled and slowly lowered to avoid back-wash. When discharged, the bucket shall be withdrawn slowly, until well above the water, so as not to disturb the concrete.

Bags used to place concrete in water shall be of at least one cubic foot capacity, made of jute or other coarse cloth and filled about two-thirds full of concrete and securely tied. They shall be carefully placed in header-and-stretcher courses so that the whole mass is interlocked. Bags used for this purpose shall be free from deleterious materials.

Placing of Fresh Concrete Against Set Concrete

Par. 6674. Before new concrete is deposited on or against concrete which has set, the surface of the set concrete shall be roughened and cleaned of laitance and foreign matter. Cleaning shall be done with water when the temperature of the surrounding air is above freezing. Steam shall be used for cleaning during freezing weather. The cleaned and wetted surfaces of the hardened concrete, including vertical and inclined surfaces, shall first be slushed with a coating of neat cement grout, against which, before it has attained its initial set, the new concrete shall be placed.

Temperature at Time of Placing

Par. 6675. Adequate equipment shall be provided for heating the concrete materials and protecting the concrete during freezing or near-freezing weather. No frozen materials or materials containing ice shall be used.

All concrete materials and all reinforcement, forms, fillers and ground with which the concrete is to come in contact, shall be free from frost. Whenever the temperature of the surrounding air is below 40 degrees Fahrenheit all concrete at the time it is placed in the forms shall have a temperature between 50 and 120 degrees Fahrenheit.

Conveying Concrete

Par. 6676. Concrete shall be conveyed from the mixer to the place of final deposit by methods which will prevent the separation or loss of material. The equipment for chuting, pumping or pneumatically conveying the concrete shall be of such size and design as to insure a practically continuous plastic flow of concrete at the delivery end.

Spouts used to convey concrete shall be so arranged that no separation of the materials may take place.

When chutes are used, the slope shall be such that the concrete materials will not separate. All chutes shall be thoroughly cleaned before and after each run, and the debris and any water shall be discharged outside of the forms.

The pumps for pumping concrete, when the pipe line contains a full charge of concrete, shall not be shut down more than one-half hour at any one time.

All water used for flushing or pressure in such pipe lines shall be wasted outside of the forms.

All equipment and methods employed for placing concrete pneumatically shall be specifically approved by the Buildings Engineer.

Construction Joint Requirements

Par. 6678. Construction joints not indicated on the plans shall be so made and located as to least impair the strength of the structure. When a joint is made, the surface of the concrete shall be prepared as required in Paragraph 6674.

Concrete shall not be poured so as to form feathered joints but shall be stopped by bulkheads perpendicular to the face of the member poured.

Construction joints in floors, not shown on drawings, shall be located near the middle of the spans of slabs, beams, or girders, unless a beam intersects a girder at this point, in which case the joints in the girders shall be offset a distance equal to twice the width of the beam. In this last case, provision shall be made for shear by use of inclined reinforcement.

At least 2 hours shall elapse after depositing concrete in the columns or walls before depositing in beams, girders, or slabs supported thereon. Beams, girders, brackets, column capitals, and haunches shall be considered as part of the floor system and shall be placed monolithically therewith.

Construction joints shall be placed where possible at right angles to the line of shear. Where construction joints must be placed parallel to the line of shear, keys shall be provided.

Removal of Water from Concrete

Par. 6679. Removal of water from concrete is permitted by vacuum, absorption or any other method that does not remove the cement.

SECTION 668

CURING CONCRETE

Scope for Curing Concrete

Par. 6680. This Section includes the treatment of concrete structures from the time concrete is poured in place to the time the concrete reaches its designed strength.

Requirements for Curing Concrete

Par. 6681. In all concrete structures, provisions shall be made for maintaining the concrete in a moist condition for a period of at least seven days after the placement of the concrete, and for high early strength concretes, special moist curing shall be provided for at least the first three days of the seven-day period after the placement of the concrete.

Requirements for Curing Concrete in Cold Weather

Par. 6682. Whenever concrete is placed in cold weather, as permitted in Paragraph 6675, adequate means shall be provided for maintaining a temperature of 50 degrees Fahrenheit for not less than 5 days after placing or for as much more time as is necessary to insure proper curing of the concrete. No dependence shall be placed on salt or other chemicals for the prevention of freezing. Manure, when used for protection, shall not be applied directly to concrete.

SECTION 669

INSPECTION, TESTS AND SUPERVISION OF CONCRETE WORK

Records of Tests on Concrete

Par. 6691. A complete record of all required tests on concrete shall be filed with the Buildings Engineer during the progress of the work.

Access to Mixing Plant and Mixing Data

Par. 6692. The Buildings Engineer and his representatives shall at all times have unrestricted access to the plant, materials, records, and other data pertaining to mixing, transporting, use and inspection of concrete.

Inspector for Mixing Plants

Par. 6693. The owner of a central concrete mixing plant shall employ the services of a responsible inspection company, approved by the Buildings Engineer, to certify the quality of materials and the proportions of all concrete transported from the plant.

Equipment for Inspectors at Mixing Plants

Par. 6694. The owner of a central concrete mixing plant shall maintain, for the inspector at the plant, the devices and equipment necessary for making all tests required to be made at the plant.

Tests for Consistency of Concrete

Par. 6695. Tests for consistency of concrete shall be made in a mold of metal shaped as a frustum of a cone 12 inches high, with a base 8 inches in diameter, and a top 4 inches in diameter. The base and the top shall be open and at right angles to the axis of the cone.

The field test for consistency of concrete shall be made at the time of placing the concrete. Tests at the mixer shall be made immediately after the batch has been discharged.

The mold shall be filled in three layers of approximately equal volumes. Each layer shall be rodded with 25 strokes of a five-eighths inch diameter rod, bullet-pointed at the lower end. The strokes shall penetrate each layer. After rodding the top layer shall be struck off with a trowel, flush with the mold. The mold shall be immediately removed by raising it carefully in a vertical direction.

The slump is the difference in inches between the height of the mold and the height of the specimen, measured immediately after the mold has been removed.

Method of Making and Storing Test Cylinders of Concrete in the Field

Par. 6696. The concrete specimen for compression test shall be cylindrical in form, having a diameter of 6 inches and a height of 12 inches when the coarse aggregate does not exceed 2 inches in size, and a diameter of 8 inches with a height of 16 inches for larger coarse aggregate.

The cylindrical mold shall be made water-tight and provided with a base plate having a plane surface, all of a substantial non-absorbent material.

The concrete for the test specimen shall be taken immediately after it has been placed in the work, or where this is impracticable, as the concrete is being delivered at the point of deposit. Each sample taken from the concrete shall be large enough to make one specimen, and different samples shall not be mixed together. Where the sample has been transported from the point of sampling, it shall be slightly mixed before being dumped into the mold.

The concrete shall be placed in the mold in 3 layers, each approximately one-third the volume of the mold. Each layer shall be rodded with 25 strokes of a five-eighths inch diameter rod, bullet-pointed at the lower end. The strokes shall penetrate each layer. After the top layer has been rodded the surface of the concrete shall be struck off flush with the mold and the mold covered.

The filled mold shall be placed in a closed storage box and kept there for 24 hours under a temperature of not less than 60 nor more than 80 degrees Fahrenheit.

The specimen shall be capped either in the field or in the laboratory. Capping in the field shall consist of a stiff neat-cement paste, placed 2 to 4 hours after filling the mold, and pressed down with a piece of plate glass not less than one-quarter inch thick or a machined metal plate not less than one-half inch thick. The cement paste shall be mixed 2 to 4 hours before placing.

The specimen shall not be removed from the mold before the end of 24 hours after the filling.

The curing of the specimen after the removal shall be as specified by the testing laboratory.

Compression Tests on Concrete

Par. 6697. Where compression tests are required on concrete, such tests shall be made in accordance with the "Standard Methods of Making Compression Tests of Concrete" of the American Society for Testing Materials, Serial Designation C39-39.

Specimens for Tests on Hardened Concrete

Par.6698. Where a test on the hardened concrete from a structure is required, the core or other specimen shall be secured as follows:

The specimen shall not be cut until the concrete has become hard enough so that the cutting will not disturb the bond between the mortar and the coarse aggregate.

The specimen shall be as nearly as possible a cylinder whose height is twice its diameter. When securing a specimen perpendicular to a horizontal surface, the beds of the specimen shall be, if possible, parallel to the horizontal bed of the concrete as originally placed. When securing a specimen perpendicular to a vertical or battered surface, the specimen shall be taken near the mid-height of such surface.

Before testing, the ends of the specimen shall be ground or capped to form a surface as nearly as possible perpendicular to the axis.

During the test the application of the load shall be, if possible, in the direction of the compaction of the mass of concrete in the structure. All specimens shall be submerged in water for 48 hours immediately before the testing.

Should the height of the specimen be less than twice the least dimension d, then the ultimate stress shall be determined by interpolation from the following table:

TABLE 6698T

Ratio of Height to Diameter	Multiply Crushing Strength by
1.75	0.98
1.50	0.97
1.25	0.94
1.10	0.90
1.00	0.85
0.75	0.70
0.50	0.50

Where h is more than 2d, no correction is necessary.

CHAPTER 67

REINFORCED GYPSUM CONSTRUCTION

Sec. 670—General Requirements for Reinforced Gypsum Construction.
Sec. 671—Materials for Reinforced Gypsum Construction.
Sec. 672—Allowable Stresses for Reinforced Gypsum Construction.
Sec. 673—Design of Reinforced Gypsum Construction.
Sec. 674—Mixing and Placing of Gypsum Concrete.
Sec. 675—Tests and Inspection of Reinforced Gypsum Construction.

SECTION 670

GENERAL REQUIREMENTS FOR REINFORCED GYPSUM CONSTRUCTION

Use of Reinforced Gypsum Concrete

Par. 6700. Reinforced gypsum concrete shall be permitted for roofs and floors supporting live loads not exceeding 95 pounds per square foot, except that poured-in-place reinforced gypsum not less than 4 inches thick may be used to support live loads not exceeding 150 pounds per square foot.

Reinforced gypsum concrete shall not be used in buildings or structures subject to impact and vibration, such as garage floors; nor in laundries, refrigeration plants, or similar locations subject to vapor or steam.

Classification of Gypsum Concrete

Par. 6701. Gypsum concrete shall be classified as follows:

Class "a"—neat gypsum.

Class "b"—gypsum concrete containing not more than three per cent of fiber by weight.

Class "c"—gypsum concrete containing not more than twelve and one-half per cent of fiber by weight.

Ultimate Strength of Gypsum Concrete

Par. 6702. The strength of gypsum concrete shall be determined by compression tests on 5 cylinders, 6 inches in diameter by 12 inches in height, or upon 5 specimens, of which the length is twice the least transverse dimension, cut from precast specimens, dried to a constant weight. The ultimate strength shall be taken as the average of the five specimens, but not more than thirty-three and one-third per cent greater that the strength of the weakest specimen.

The minimum ultimate strength and the modulus of elasticity in pounds per square inch for various classes of gypsum concrete shall be as follows:

TABLE 6702T

Class of Gypsum Concrete	Minimum Ultimate Strength	Modulus of Elasticity
Class "a"	1500	1,000,000
Class "b"	800	600,000
Class "c"	450	200,000

Protection for Gypsum Concrete

Par. 6703. All gypsum concrete slabs exposed to the weather shall be protected by a waterproof covering.

SECTION 671

MATERIALS FOR REINFORCED GYPSUM CONSTRUCTION

Gypsum

Par. 6710. The term "gypsum" as used in this Chapter shall mean calcined gypsum manufactured from gypsum meeting the requirements of the "Standard Specifications for Gypsum" of the American Society for Testing Materials, Serial Designation C22-25.

Bar Reinforcement for Gypsum Concrete

Par. 6711. Bar reinforcement for gypsum concrete shall meet the requirements of the "Standard Specifications for Billet-Steel Concrete Reinforcement Bars," of the American Society for Testing Materials, Serial Designation A15-39.

Wire Reinforcement for Gypsum Concrete

Par. 6712. Wire reinforcement shall meet the requirements of the "Standard Specification for Cold-Drawn Steel Wire for Concrete Reinforcement," of the American Society for Testing Materials, Serial Designation A82-34.

Water for Gypsum Concrete

Par. 6713. Water used for mixing gypsum concrete shall be clear and free from acids, alkalis or organic material.

Fiber for Gypsum Concrete

Par. 6714. Fiber for gypsum concrete shall be mineral fiber or wood chips, shavings, excelsior or similar fiber approved by the Buildings Engineer.

SECTION 672

ALLOWABLE STRESSES FOR REINFORCED GYPSUM CONSTRUCTION

Allowable Stresses for Gypsum Concrete

Par. 6720. The stresses for gypsum concrete shall not exceed the following values, in which f_g indicates the ultimate strength of the gypsum concrete:

Maximum unit compression in bending	$0.25f_g$
Axial compression or bearing	$0.20f_g$
Bond	$0.02f_g$
Shear	$0.02f_g$

The reinforcement shall be mechanically anchored when these values for bond and shear are used.

Allowable Stresses for Reinforcement in Gypsum Concrete

Par. 6721. The tensile stresses in pounds per square inch for reinforcement in gypsum concrete shall not exceed the following values:

Billet steel bars	18,000
Cold drawn wire	20,000
Welded steel fabric	20,000

SECTION 673

DESIGN OF REINFORCED GYPSUM CONSTRUCTION

Design of Gypsum Concrete Slabs

Par. 6730. Gypsum concrete slabs for floor and roof construction shall be reinforced and designed to support all loads in accordance with the accepted formulas for reinforced concrete.

Precast gypsum slabs of special design, the strength of which cannot be determined by the application of accepted engineering formulas, shall be permitted to carry a uniformly distributed load equal to one-fourth of the total load that caused the failure of a full-size test panel with the load applied along two sides, placed one-third of the span from each support.

Precast Gypsum Slabs

Par. 6731. Precast gypsum slabs shall be permitted only when approved by the Buildings Engineer.

Gypsum concrete for precast units shall be either Class "a" or Class "b".

Solid precast gypsum slabs shall have a thickness of not less than 2 inches. Hollow precast gypsum slabs, permitted only in roof construction, shall have a total thickness of not less than 3 inches and a shell thickness of not less than one-half inch.

Unless the shape or marking of the slab is such as to insure its being placed right side up, the reinforcing shall be symmetrical so that the slab can support its load either side up.

Laying Precast Gypsum Slabs

Par. 6732. For precast solid reinforced gypsum units, bound on the edges with structural or pressed sheet steel of approved design anchored to the units, whose length is not less than one and one-half times the span, and whose edges are made to interlock with adjoining units in the manner of tongued and grooved wooden planks and are of sufficient strength to transmit the load on one unit to adjacent units, the end joints may be staggered at random, but not less than 2 feet, and the construction may be designed as continuous. In the center third of a span there shall be not more than one joint in five courses or rows of units. If the length of units is less than one and one-half times the span, or if no wall support is provided for the first row of units along a wall, such units shall be cut so that the end joints will occur over beam supports.

Each precast unit shall be firmly fastened to each supporting member.

Poured-In-Place Gypsum Slabs

Par. 6733. Poured-in-place gypsum slabs, other than suspension systems, shall have a thickness of not less than two inches. When such slabs are poured on gypsum form boards, the thickness of forms may be included in the required thickness of the slab, but the thickness of the poured section shall be never less than two inches.

Gypsum Suspension Systems

Par. 6734. Gypsum slabs for suspension systems shall have a thickness of not less than 3 inches for roofs or 4 inches for floors.

The reinforcing shall consist of wires with continuity through multiple spans and anchored at the ends. The wires shall be supported in the top of the slab by the roof or floor beams and shall be tightly drawn down as nearly to the bottom of the slab at mid-span as fire protection or structural requirements will permit, but never less than one-half inch from the bottom. Provision shall be made in the framing of the end bays of this system for resisting the forces due to end anchorage of the wires.

The wires shall be designed for a tension per foot width of slab equal to

$$\frac{wL^2}{8d}$$

in which

w is the total load in pounds per square foot.
L is the span in feet.
d is the sag of the wire in feet.

Supports for Gypsum Slabs

Par. 6735. The supporting members for gypsum floor or roof slabs shall be of incombustible materials, and their spacing shall be such that the superimposed load on the slab will not cause a deflection of the slab greater than 1/360 of the distance between its supports.

SECTION 674

MIXING AND PLACING OF GYPSUM CONCRETE

Mixing of Gypsum and Fiber

Par. 6740. The gypsum and fiber used in gypsum concrete shall be mill-mixed. Water for proper consistency shall be added at the job.

Mixing and Placing Gypsum Concrete

Par. 6741. Gypsum concrete shall be mixed in a mixing box. The mill-mixed gypsum and fiber shall be added to the water and thoroughly mixed and poured as soon thereafter as practicable. The mix shall not be retempered.

After pouring, the gypsum concrete shall be screeded to the desired grade or level.

SECTION 675

TESTS AND INSPECTION OF REINFORCED GYPSUM CONSTRUCTION

Testing of Gypsum and Gypsum Products

Par. 6750. All gypsum and gypsum products shall be tested in accordance with the "Tentative Methods of Testing Gypsum and Gypsum Products" of the American Society for Testing Materials, Serial Designation C26-39T.

Inspection During Placing of Gypsum Concrete

Par. 6751. A competent inspector satisfactory to the Buildings Engineer shall be at all times on the work when gypsum concrete is being mixed and placed.

CHAPTER 68

COMPOSITE CONSTRUCTION

Sec. 680—General Requirements for Composite Construction.
Sec. 681—Composite Columns.
Sec. 682—Composite Beams.
Sec. 683—Composite Floors.

SECTION 680

GENERAL REQUIREMENTS FOR COMPOSITE CONSTRUCTION

Scope of Composite Construction

Par. 6800. Composite construction includes structural members made of two or more kinds of materials so arranged that they share stresses.

Materials, Stresses and Methods for Composite Construction

Par. 6801. The materials, allowable stresses and methods of design and construction for Composite Construction shall meet the general requirements of this Code, except as otherwise specifically required by this Section.

Theory of Design of Composite Members

Par. 6802. The materials for composite members shall be assumed to share the stresses in relation to their moduli of elasticity.

Symbols and Notations for Composite Design

Par. 6803. The symbols and notations used for the design of composite construction are as follows:

A —area, in square inches, of the concrete above the neutral axis.

A_b —area, in square inches, of steel beam or other section.

A_c —net area of concrete section in square inches $=A_g—A_s—A_r$.

A_g —the gross area, in square inches, of the column.

A_r —area, in square inches, of the metal core or pipe.

A_s —area, in square inches, of vertical bar reinforcement.

a —distance, in inches, from the compression face of the concrete to the neutral axis of the steel beam or other section.

b —effective width, in inches, of the slab which may be considered as flange; net width, in inches, of individual concrete section in concrete-filled floor.

d —distance, in inches, from the compression face of the concrete to the far face of the steel beam.

d' —distance, in inches, from the compression face of the concrete to the near face of the steel beam.

d_1 —diameter or least lateral dimension of column in inches.

f_c —maximum compressive stress, in pounds per square inch, in concrete.

f'_c —ultimate compressive strength of the concrete in pounds per square inch.

f'_r —permissible stress, in pounds per square inch, on the unencased metal core or the unfilled pipe.

f_s —maximum tensile stress, in pounds per square inch, in the steel section.

f_{sb} —maximum tensile stress, in pounds per square inch, in steel beam.

f'_{sb} —maximum compressive stress, in pounds per square inch, in steel beam.

h —unsupported length of column in inches.

I —equivalent moment of inertia of the transformed section.

I_b —moment of inertia, in inches^4, of steel beam.

n —ratio of modulus of elasticity of steel to that of concrete.

t —thickness of slab, in inches; total thickness of concrete filled floor, in inches.

x —the distance, in inches, from the compression face of the concrete to the center of gravity of the concrete.

y —distance, in inches, from the compression face of the concrete to the neutral axis of the transformed section.

SECTION 681

COMPOSITE COLUMNS

Classification of Composite Columns

Par. 6810. Composite columns shall be classified as spiral-reinforced, mesh-reinforced and filled pipes.

A spiral-reinforced composite column is a column in which a structural steel or cast-iron column is completely encased in concrete reinforced with both longitudinal and spiral reinforcement.

A mesh-reinforced composite column is a column in which a structural steel column, designed to carry the principal part of the load, is completely encased in concrete reinforced with a wire mesh.

A filled-pipe column is a column consisting of a steel pipe filled with concrete.

Concrete columns reinforced with structural shapes, such as angles or tees, tied with lacing bars or tie plates, so as to form a structural unit, in which the total area of the structural shapes does not exceed four per cent of the gross area of the concrete, shall be classed as tied reinforced columns and designed in accordance with Paragraph 6564.

Transfer of Loads to Spiral-Reinforced Composite Columns

Par. 6811. Transfer of loads to the metal core of spiral-reinforced composite columns shall be provided for by the use of bearing members such as billets, brackets or other positive connections. Transfer of loads to the concrete encasement shall be provided for by ample sections of concrete and continuity of reinforcement at the junction with beams or girders.

Construction Loads On Metal Cores in Composite Columns

Par. 6812. The metal cores in composite columns shall be designed to carry any construction or other loads to be placed upon them prior to their encasement in concrete.

Permissible Loads On Spiral-Reinforced Composite Columns

Par. 6813. The permissible axial load P in pounds on a spiral-reinforced composite column having a length not greater than 10 times the least lateral dimension shall not exceed that given by the following formula:

$$P=0.22f_c{}' A_c+f_s A_s+f_r A_r.$$

$f_s = 16{,}000$ for billet, rail or axle steel.

$f_r = 16{,}000$ for intermediate grade steel and 10,000 for cast iron.

The column as a whole shall satisfy the requirements of the preceding formula at any point; in addition to this, the reinforced concrete portion shall be designed to carry, in accordance with the formula in Paragraph 6563, all loads brought onto the column at levels between the metal brackets or connections. In applying the formula in Paragraph 6563, the value of A_g shall be interpreted as the area of the concrete section outside the metal core. The permissible load on the reinforced concrete section shall be further limited to $0.35f'_cA_g$.

The permissible axial load P′ in pounds on a spiral-reinforced composite column having a length greater than 10 times the least lateral dimension shall not exceed that given by the following formula:

$$P' = P\left(1.3 - .03\frac{h}{d_1}\right)$$

Metal Core and Reinforcement for Spiral-Reinforced Composite Columns

Par. 6814. The cross-sectional area of the metal core shall not exceed 20 per cent of the gross area of the spiral-reinforced composite column. If a hollow metal core is used, it shall be filled with concrete. At splices, metal cores shall be accurately milled and firmly held in alignment.

The amounts of longitudinal and spiral reinforcement and the requirements as to spacing of bars, details of splices and thickness of protective shell outside the spiral shall conform to the limiting values specified in Paragraph 6563. A clearance of at least 3 inches shall be maintained between the spiral and the metal core at all points except that when the core consists of a structural steel H-column, the minimum clearance may be reduced to 2 inches.

Bases of Spiral-Reinforced Composite Columns

Par. 6815. The base of the metal core shall be designed to transfer the load from the entire spiral-reinforced composite column to the footing, or it may be designed to transfer the load from the metal section only, provided it is so placed in the pier or pedestal as to leave ample section of concrete above the base for the transfer of load from the reinforced concrete section of the column by means of bond on the vertical reinforcement and by direct compression on the concrete.

Transfer of Loads to Mesh-Reinforced Composite Columns

Par. 6816. All loads carried by a mesh-reinforced composite column shall be received directly by the structural steel column by the use of bearing members, such as billets, brackets or ther positive connections.

Encasement for Mesh-Reinforced Composite Columns

Par. 6817. The concrete encasement for mesh-reinforced composite columns shall have a compressive strength of at least 2000 pounds per square inch and a thickness of at least two and one-half inches over all metal of the core, except rivet heads.

The concrete shall be reinforced by the equivalent of welded wire mesh having wires of 0.135 of an inch in diameter, the wires encircling the column being spaced not more than 4 inches apart and those parallel to the column axis not more than 8 inches apart. This mesh shall extend entirely around the column at a distance of one inch inside the outer concrete surface and shall be lap-spliced at least 40 wire diameters and wired at the splice.

Permissible Load On Mesh-Reinforced Composite Columns

Par. 6818. The permissible axial load P in pounds on a mesh-reinforced composite column shall not exceed that given by the following formula:

$$P = A_r f'_r \left(1 + \frac{A_c}{100 A_r}\right)$$

Permissible Load On Filled-Pipe Columns

Par. 6819. The permissible axial load P in pounds on a filled-pipe column shall not exceed that given by the following formula:

$$P = 0.22\, f_c' A_c + f_r' A_r.$$

in which the value of f'_r shall be that permitted for structural steel in Paragraph 6323. If the material of the pipe has a lower yield point than that of structural steel the allowable stress shall be reduced proportionately and when the yield point is unknown, the allowable stress shall be reduced by 50 per cent.

Material surrounding a filled-pipe column for fire protection shall not be considered either as load bearing or as increasing the radius of gyration.

SECTION 682

COMPOSITE BEAMS

Scope of Composite Beams

Par. 6820. Composite beams include beams composed of structural steel members, such as beams, open web joists or trusses, solidly encased in concrete.

Design of Composite Beams Containing Steel Beams

Par. 6821. A rolled or fabricated steel beam entirely encased in concrete at least one and one-half inches thick and supporting a reinforced concrete floor or roof slab shall be permitted to be designed for bending as a composite beam.

The computed stresses in such a composite beam for a given bending moment M in inch-pounds, shall not be less than those given by the following formulas:

$$y=\frac{bt^2+2nA_ba}{2(bt+nA_b)}$$

$$I=bt\left[\frac{t^2}{12}+\left(y-\frac{t}{2}\right)^2\right]+n\left[I_b+A_b(a\text{-}y)^2\right]$$

$$f_c=\frac{My}{I}$$

$$f_{sb}=\frac{M(d-y)n}{I}$$

$$f'_{sb}=\frac{M(y-d')n}{I}$$

The flange of such a composite beam shall meet the requirements for T-beam flanges in Paragraph 6545.

Concrete beams having structural steel beams or other shapes for reinforcement, with such beams or shapes entirely below the neutral axis, shall be designed as reinforced concrete beams.

Shear on Composite Beams Containing Steel Beams

Par. 6822. The structural steel beam in a composite beam shall be designed to resist all shearing forces.

Design of Composite Beams Containing Steel Trusses

Par. 6823. Composite beams containing steel trusses or open-web joists shall be designed as doubly-reinforced concrete beams.

The web members shall be assumed to resist only diagonal tension or shear.

SECTION 683

COMPOSITE FLOORS

Scope of Composite Floors

Par. 6830. Composite floors shall include concrete filled floors made of I-bars, T-bars, or other structural sections, placed on supports, with the space between the sections filled with concrete flush with their tops.

Design of Concrete Filled Floors

Par. 6831. The computed stresses in a concrete filled floor, for a given bending moment M in inch-pounds, shall not be less than those given by the following formulas:

$$y = \frac{Ax + nA_b a}{A + nA_b}$$

$$f_s = \frac{nM(t-y)}{I}$$

$$f_c = \frac{My}{I}$$

Concrete for Concrete Filled Floors

Par. 6832. The fill for concrete filled floors, when not exposed to the weather, shall be at least 2000-pound concrete and when exposed to the weather, at least 3000-pound concrete. It shall have a slump of not more than two inches and shall be placed with vibrators.

Steel for Concrete Filled Floors

Par. 6833. All steel used for concrete filled floors shall be copper bearing structural steel which meets the requirements of Paragraph 6310.

Structural Details of Concrete Filled Floors

Par. 6834. The structural shapes of concrete filled floors shall be tied together by cross-bars welded or driven into tightly fitting slots and arranged to resist horizontal shear.

CHAPTER 69

INDETERMINATE STRUCTURES

Sec. 690—Indeterminate Structures.

SECTION 690

INDETERMINATE STRUCTURES

Scope of Indeterminate Structures

Par. 6900. Indeterminate structures shall include all structures which involve more unknown factors, whether internal or external, than can be reasonably ascertained by the application of static equations and whose correct analysis and design involves consideration of their elastic properties.

Design of Indeterminate Structures

Par. 6901. The analysis and design of indeterminate structures shall be based on the application of fundamental elastic equations or their variants such as the theorem of three moments and the principle of least work.

The effects of rib shortening, temperature changes and settlement of supports shall be carefully investigated and any assumptions made relative to these factors shall be clearly indicated on a stress sheet or other drawing.

Alterations to Existing Indeterminate Structures

Par. 6902. Alterations to existing indeterminate structures shall not be made without a complete new analysis and design for the proposed alterations. The method of carrying out these alterations and the sequence of the operations shall be clearly indicated on the drawings.

PART VII

CONSTRUCTION REGULATIONS

Chap. 70—Foundations and Footings.
Chap. 71—Solid Masonry Walls.
Chap. 72—Hollow Masonry Walls.
Chap. 73—Faced Masonry Walls.
Chap. 74—Non-Masonry Walls.
Chap. 75—Floor and Roof Construction.
Chap. 76—Door and Window Construction.
Chap. 77—Means of Egress.
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CHAPTER 70

FOUNDATIONS AND FOOTINGS

Sec. 700—General Requirements for Foundations.
Sec. 701—Soil Foundations.
Sec. 702—Pile Foundations.
Sec. 703—Wooden Piles.
Sec. 704—Concrete Piles.
Sec. 705—Concrete-Filled Cylindrical Steel Piles.
Sec. 706—Rolled Steel Piles.
Sec. 707—Caisson Piers.
Sec. 708—Foundation Load Tests.
Sec. 709—Footings.

SECTION 700

GENERAL REQUIREMENTS FOR FOUNDATIONS

Scope of Foundations

Par. 7000. Foundation shall be defined as: (1) the prepared surfaces of ledge rock in its natural bed and natural deposits of gravel, sand, clay or any combination of them; (2) the cut-offs of piles in place; and (3) the tops of caisson piers as defined in Section 707.

Excavating for Foundations

Par. 7001. Excavations for foundations shall be done in accordance with the requirements of Chapter 22.

Shoring for Foundations

Par. 7002. Shoring for foundations shall be done in accordance with the requirements of Chapter 23.

Borings and Test Pits

Par. 7003. If the thickness of the load-bearing stratum and the character of the stratum immediately below are in doubt, or if, for any other reason, the foundation may be deemed unsatisfactory by the Buildings Engineer, he shall require the owner to dig pits or make borings at such locations and carried to such depths as will disclose the character of the material underlying the site of the proposed structure.

When it is proposed to support a structure directly on bedrock, the Buildings Engineer may require a drill hole or a core boring to be made at each pier location, carried into the rock a depth of at least 10 feet to prove that sound bedrock has actually been reached.

Depth of Foundations

Par. 7004. All foundations shall have a depth sufficient to meet the requirements of Paragraph 7090.

Foundation Loads

Par. 7005. The loads and forces to be used in computing the maximum pressure on foundations shall be the dead loads of the structure, live loads and lateral forces. For this purpose, the reduced live loads permitted in Paragraph 6035 may be used.

Where the pressure on a foundation due to wind is less than thirty-three and one-third per cent of that due to dead and live loads, and lateral forces, other than wind, it may be neglected. Where this ratio exceeds thirty-three and one-third per cent, foundations shall be so proportioned that the pressure due to combined dead and live loads and lateral forces, including wind, shall not exceed the allowable bearing values by more than thirty-three and one-third per cent.

Eccentricity of loading in foundations shall be fully investigated and the maximum pressure shall not exceed the allowable bearing values.

SECTION 701

SOIL FOUNDATIONS

General Regulations for Soil Foundations

Par. 7010. Soil foundations shall be in natural ground, but the Buildings Engineer may permit the foundations of light structures, which are not more than 20 feet in height, to be in good filled soil which has been placed in practically level layers and has had sufficient time to settle.

Classification of Bearing Materials

Par. 7011. For the purpose of this Code, bearing materials for soil foundations shall be classified as follows, the terms used in the classification being in accordance with generally accepted geological and engineering nomenclature:

Massive Bedrock: Includes granite, diorite, and other granitic rocks; gneiss, trap rock, felsite and thoroughly cemented conglomerates; sedimentary rocks, as sandstones, limestones; all in sound conditions (allows some cracks) and requiring blasting for removal.

Shale: A laminated, fine-textured, soft rock composed of consolidated clay or silt, which cannot be molded without the addition of water.

Schist: A fine-textured, laminated rock with a more or less wavy cleavage, containing mica or other flaky minerals.

Gravel: An uncemented mixture of mineral grains one-quarter inch or more in diameter.

Coarse Sand: A sand consisting chiefly of grains smaller than one-quarter inch in diameter which is retained on a 65-mesh sieve.

Fine Sand: A sand consisting chiefly of grains which will pass a 65-mesh sieve.

Compact Gravel; Compact Sand: Deposits requiring picking for removal and offering high resistance to penetration by excavating tools.

Loose Gravel; Loose Sand: Deposits readily removable by shoveling only.

Hardpan: A thoroughly compacted mixture of clay, sand, gravel and boulders; or a cemented mixture of sand or of sand and gravel, with or without boulders, and difficult to remove by picking.

Hard Clay: A clay requiring picking for removal, a fresh sample of which cannot be molded in the fingers, or can be molded only with the greatest difficulty.

Medium Clay: A clay which can be removed by spading, a fresh sample of which can be molded by a substantial pressure of the fingers.

Soft Clay: A clay which, when freshly sampled, can be molded under relatively slight pressure of the fingers.

Allowable Bearing Value of Soils

Par. 7012. In the absence of satisfactory load tests, the maximum pressure on soil foundations shall not exceed the allowable bearing values set forth in the following table:

TABLE 7012T

Kind of Soil	Tons per sq. ft.
Massive bedrock, in sound condition	100
Laminated rocks, such as schists, in sound condition	35
Shale in sound condition	10
Hardpan	
Residual deposits of shattered or broken bedrock of any kind, except shale	
Clay, hard	6
Gravel, sand-gravel mixture, compact	5
Gravel, sand-gravel mixture, loose	4
Sand, coarse, compact	
Clay, medium	
Sand, coarse, loose	3
Sand, fine, compact	
Clay-Sand mixture, firm and dry	
Clay and sand in alternate layers, wet and springy	1½
Sand, fine, loose	1
Clay, soft	
Alluvial deposits, shattered shale, or any unusual deposits not provided for herein	To be fixed by the Buildings Engineer

Bearing on Soft Underlying Strata

Par. 7013. Where the bearing materials directly under a foundation overlie a stratum having smaller allowable bearing value, this smaller value shall not be exceeded at the level of such stratum. Computation of the vertical pressure in the bearing materials at any depth below a foundation shall be made on the assumption that the load is spread uniformly at an angle of 60 degrees with the horizontal; but the area considered as supporting the load shall not extend beyond the intersection of 60-degree planes of adjacent foundations.

Uneven Settlement of Foundations

Par. 7014. Where portions of the foundation of an entire structure rest directly upon or are underlain by medium or soft clay, and other portions rest upon different materials, or where the layers of such softer materials vary greatly in thickness, the magnitude and distribution of the probable settlement shall be investigated as specified in Paragraph 7081, and, if necessary, the allowable loads shall be reduced or special provisions be made in the design of the structure to prevent dangerous differential settlements.

Flowing Water in Foundations

Par. 7015. Whenever, in an excavation, an inward or upward flow of water develops in an otherwise satisfactory bearing material, special methods satisfactory to the Buildings Engineer shall be immediately adopted to stop or control the flow to prevent disturbance of the bearing material.

SECTION 702

PILE FOUNDATIONS

General Requirements for Pile Foundations

Par. 7020. The supporting capacity of piles shall be obtained from bearing upon or embedment in satisfactory bearing materials as defined in Paragraph 7011.

Types of pile construction not specifically provided for in this Chapter shall meet such additional requirements as may be prescribed by the Buildings Engineer.

Allowable Load on Piles

Par. 7021. The allowable pile loading shall be limited by the requirement that the vertical pressures in the bearing materials at or below the points of the piles produced by the loads on all piles in a foundation shall not exceed the allowable bearing values of such materials, as specified in Paragraph 7012. Piles or pile groups shall be assumed to transfer their loads to the bearing materials by spreading the load uniformly at an angle of 60 degrees with the horizontal, starting at a polygon circumscribing the piles at the top of the satisfactory bearing stratum in which they are embedded, but the area considered as supporting the load shall not extend beyond the intersection of the 60 degree planes of adjacent piles or pile groups.

The allowable load on each pile shall be further limited by the requirement that such load shall not cause excessive movement of the pile relative to the soil. Satisfactory proof of this load for all soil conditions and types of piles can be obtained from load tests conducted in accordance with Paragraph 7082. In the absence of such proof of the supporting capacity, the load on any pile shall not exceed the allowable value determined in accordance with the following formulas, provided the bearing values thus obtained are not greater than the maximum allowable loads given for the various kinds of piles:

$$R = \frac{3\ W\ h}{s + k} \times \frac{W}{W + P} \text{ for drop hammers.}$$

$$R = \frac{3.6\ W\ h}{s + k} \times \frac{W}{W + P} \text{ for single-acting steam hammers.}$$

$$R = \frac{4\ F}{s + k} \times \frac{W}{W + P} \text{ for double-acting steam hammers.}$$

in which:

W = Weight of striking part of hammer in pounds.

h = Height of fall of hammer in feet.

P = Weight of pile or apparatus, as driven, in pounds.

s = Average penetration of blow, in inches, for the last 5 blows. When a drop hammer is used, the last 5 blows shall be made with the hammer falling not more than 10 feet.

R = Allowable pile load in pounds.

F = Actual energy delivered per blow in foot pounds.

$k = \frac{3\ R\ L}{2\ A\ E} + C$, in inches.

L = Length of pile or apparatus being driven, in inches.

A = Average sectional area of pile material, as driven, in square inches.

E = Modulus of elasticity of pile material, as driven, in pounds per square inch.

C = Constant = 0.05, for a wooden pile or driving cap.

In computing the allowable load of a pile driven with a follower, the value of k computed for the follower itself shall be added to the value of k for the pile; the weight of the follower shall be added to the weight of the pile and included in P.

The value of k may be determined from the allowable pile load assumed in the design unless the allowable load computed from the penetration varies more than 20 per cent from such assumed load, in which case the assumed value of the allowable pile load shall be correspondingly changed and new value of k computed, or the quadratic equation shall be solved for R.

Double-acting steam hammers shall be equipped with an approved device for determining the actual energy in foot pounds per blow delivered, or a plate bearing the certified energy delivered at a given steam pressure.

The penetration s for an allowable pile load R, shall not exceed the following:

$$s = \frac{3\,W\,h}{R} \times \frac{W}{W + P} - k \text{ for drop hammers.}$$

$$s = \frac{3.6\,W\,h}{R} \times \frac{W}{W + P} - k \text{ for single-acting hammers.}$$

$$s = \frac{4\,F}{R} \times \frac{W}{W + P} - k \text{ for double-acting hammers.}$$

A negative value of (s) indicates that a heavier hammer shall be used.

Piles in water or very soft soil and free-standing piles without lateral support shall conform with the applicable column formulas as stated in Part VI. Piles driven into firm ground may be considered fixed at 5 feet below the ground surface and in soft material at 10 feet below the ground surface. Where the deck structure is light, the unsupported length of such free-standing piles may be assumed as two-thirds the distance from the deck connection to the point of fixity. Where the top of the pile is fixed in all directions by heavy girders into which the pile is framed, such length may be assumed as one-half the distance from the top of pile to the point of fixity in the soil.

Excavation for Pile Foundations

Par. 7022. The excavation for pile foundations, wherever practicable, shall be completed to the pile cut-off elevation, before piles are driven. In no case shall piles be driven through more than 3 feet of unexcavated material above pile cut-off elevation.

Method of Pile Driving

Par. 7023. The method of driving shall be such as not to impair the strength of the pile and shall meet with the approval of the Buildings Engineer. A steel or iron follower may be used subject to his approval. It shall be equipped with a suitable socket encasing the pile head sufficiently to prevent damage while driving. Shattered, broomed or otherwise damaged pile heads shall be cut back to sound material before driving with the follower. If a wooden driving block is used, it shall, at the time it is used for measuring the penetration, be of sound hard wood equal to oak, not more than 12 inches in height, with the grain parallel to the axis of the pile, and shall be enclosed in a steel casing of adequate strength to resist lateral distension.

Where piles are driven through soft soil to hard bearing material, providing high point resistance, the elevation of all piles or pile shells previously driven shall be measured to detect uplift; and if uplift occurs in any pile or pile shell while other piles are being driven, such pile or pile shells shall be driven again to the required resistance.

The data used in determining driving resistance shall be obtained during the driving and not upon redriving when a pile has been allowed to stand more than one hour after having been driven. When driving wooden piles, broomed heads shall be cut to sound wood before making penetration measurements.

Piles Damaged During Driving

Par. 7024. Additional piles shall be driven to replace piles which are broken, broomed, or otherwise seriously damaged and to supplement piles having supporting capacities less than those required by the design.

Jetting Piles

Par. 7025. Piles shall not be jetted except with the specific approval of the Buildings Engineer. After jetting, piles shall be driven to the required resistance. Jetting shall be done in such a manner that the supporting capacity of piles already in place or other foundations shall be unimpaired.

Piles Supporting Detached Columns and Piers

Par. 7026. A detached column or pier supported by piles shall rest upon not less than 3 piles, but a column or pier connected to permanent construction, which provides adequate lateral support to the tops of the piles, may rest upon less than 3 piles.

Piles Supporting Walls

Par. 7027. A foundation wall of a building not more than one story or 20 feet high, if supported laterally by masonry, reinforced concrete or steel construction at intervals not exceeding 20 feet, may be supported by a single row of piles. However, if the distance between such lateral supports exceeds 10 feet, the piles shall be provided with a continuous cap as required in Paragraph 7098. All other foundation walls supported on piles shall rest upon at least two rows of piles. The rows shall be at least two feet on centers under buildings up to 35 feet in height and at least three feet on centers under buildings higher than 35 feet.

Inspection of Piles

Par. 7028. A competent inspector, qualified by experience and training, shall be on the work at all times while piles are being driven. The inspector shall make an accurate record of the material and the principal dimensions of each pile, of the weight and fall of the hammer, and, if a steam hammer, the make, type, weight and stroke, and of the average penetration of each pile for at least the last five blows, together with the elevation at the tip and cut-off. A copy of such record shall be filed and kept in the office of the Buildings Engineer.

SECTION 703

WOODEN PILES

General Requirements for Wooden Piles

Par. 7030. Every wooden pile shall be in one piece, cut from a sound live tree, and free from defects which may materially impair its strength or durability. It shall be butt-cut above the ground swell, and have a substantially uniform taper from butt to tip. Wooden piles shall measure at least 6 inches in smallest diameter at the tip, at least 11 inches in smallest diameter 2 feet from the butt, and at least 10 inches in smallest diameter at the cut-off; these dimensions being taken under the bark. The axis of a wooden pile shall not deviate more than one inch for each 10 feet of length nor more than 6 inches from a straight line connecting the center of the butt and the center of the tip. Square timber of approved quality may be used as piling, in which case the average cross-section shall be not less than 10 by 10 inches and the tip shall be not less than 6 by 6 inches.

The minimum penetration of wooden piles shall be 12 feet.

Load on Wooden Piles

Par. 7031. Wooden Piles shall not be loaded in excess of 500 pounds per square inch of the right section of the piles at mid-length, nor in excess of the allowable load specified in Paragraph 7021.

Spacing of Wooden Piles

Par. 7032. The center-to-center spacing of wooden piles shall not be less than 24 inches nor less than twice the butt diameter.

Wooden Pile Cut-off Elevations

Par. 7033. All wooden load-bearing piles shall be cut off to sound wood at or below the lowest ground water or other water level or not more than 18 inches above mean low tide, except that such piles under the following conditions may be cut off at any elevation:

1. When they are creosoted and their cut tops are treated as required in Paragraph 6277.
2. When they are untreated and are intended to support builidngs of Types F and G, if the portion of the piles above permanent water level will be readily available for inspection.

Creosoted Piles

Par. 7034. Wooden piles treated with creosote shall meet the requirement of Section 627.

No creosoted piles shall be used if the creosoted shell has been penetrated by injuries in handling or driving, or otherwise, except in the case of bolt holes and unavoidable framing, including the top cut-off, all of which shall be treated as required in Paragraph 6277.

SECTION 704

CONCRETE PILES

General Requirements for Precast Concrete Piles

Par. 7041. Precast concrete piles in one piece shall be designed, cast and cured to have the strength necessary for handling and for driving. The concrete shall be proportioned to have a compressive strength of at least 3000 pounds per square inch and shall conform to the requirements of Chapters 64 and 66.

The diameter, or least lateral dimension, of such piles shall be 10 inches or more at the point and shall average at least 12 inches throughout the length of the pile for piles up to 20 feet, 14 inches for piles up to 30 feet and 15 inches for piles up to 40 feet. For piles over 40 feet in length, the diameter, or least lateral dimension, shall be not less than one thirty-fifth of the length, except that all piles shall be at least 15 inches, and shall not be required to exceed 24 inches, in diameter, or least lateral dimension.

The minimum penetration of precast concrete piles shall be 10 feet.

Reinforcement of Precast Concrete Piles

Par. 7042. Precast concrete piles shall be reinforced as required for tied columns in Paragraph 6564, except as otherwise specified herein. The ratio of the area of the longitudinal reinforcement to the cross-sectional area of the pile at mid-length shall be not less than 2 per cent. For a length of 4 feet at both ends of the pile, lateral ties shall be spaced not over 3 inches center to center or an equivalent spiral shall be provided. Reinforcing steel shall be embedded in the concrete forming the body of the pile at least one and one-half inches from any exposed surface and in piles exposed to open water such coverage shall be at least 3 inches.

Spacing of Precast Concrete Piles

Par. 7043. The minimum spacing center to center of precast concrete piles shall be two and one-half times the square root of the cross-sectional area of the butt.

Load on Precast Concrete Piles

Par. 7044. The load on any precast concrete pile shall not exceed that permitted for reinforced concrete columns in Section 656 nor the allowable load specified in Paragraph 7021. For the portions of such piles which are in firm soil which provides adequate lateral support, the unsupported length may be considered to be less than 10 times the least lateral dimension thereof.

Metal Shoes for Precast Concrete Piles

Par. 7045. When precast concrete piles are driven through materials or through hard materials containing boulders, they shall have metal tips of approved design.

General Requirements for Cast-in-Place Concrete Piles

Par. 7046. Cast-in-place concrete piles shall be so made and placed as to insure the exclusion of all foreign matter and to secure a well-formed unit of full cross-section. The minimum diameter of unencased cylindrical piles shall be 14 inches; of encased cylindrical piles, 12 inches and of conical piles, 8 inches at the point and 11 inches at the half-length of the pile. They shall be driven in such order and with such spacing as to insure against distortion or injury to finished piles.

Cast-in-place concrete piles include, among others, step taper piles and steel fluted shell concrete piles.

Filling Cast-in-Place Concrete Piles

Par. 7047. Cast-in-place concrete piles shall be filled with concrete having an ultimate strength of not less than 2000 pounds per square inch and meeting the requirements of Chapters 64 and 66. Before any concrete is placed, the casings shall be examined and made free of earth, debris, water or any other foreign matter. The placing of concrete for each pile shall be continuous and shall not be done until all pile driving within a radius of 15 feet has been completed.

Spacing of Cast-in-Place Concrete Piles

Par. 7048. The spacing, center-to-center, of cast-in-place concrete piles shall be sufficient to insure the preservation of the full cross-section, but in no case shall it be less than twice the average diameter of the embedded portion of the pile, with a minimum of 30 inches.

Load on Cast-in-Place Concrete Piles

Par. 7049. The stress, f_c, on the concrete of any cast-in-place pile shall not exceed the following percentages of the ultimate compressive strength of the concrete:

Uncased cylindrical pile	20 per cent
Cased cylindrical pile	25 per cent
Conical pile	30 per cent

The load on the pile shall not exceed $f_c\ (A_c + n\ A_s)$, nor the allowable load specified in Paragraph 7021. In the preceding formula, "A_c" is the net area of the concrete and "A_s" is the net area of longitudinal steel which extends for the full length of the pile, both taken at the mid-length of the pile, and "n" is the ratio of the modulus of elasticity of steel to that of the concrete. The area of steel in casings shall not be used in computing "A_s" unless the casing is at least 0.15 of an inch thick, in which case at least one-sixteenth of an inch shall be deducted from the thickness before computing the area.

SECTION 705

CONCRETE-FILLED CYLINDRICAL STEEL PILES

Scope of Concrete-Filled Cylindrical Steel Piles

Par. 7050. This Section includes the requirements for piles consisting of steel cylinders filled with concrete, where the steel shell carries part of the load on the pile.

General Requirements for Concrete-Filled Cylindrical Steed Piles

Par. 7051. Piles consisting of concrete-filled cylindrical steel shells, filled after driving, shall have an inside diameter of not less than 10 inches and a shell thickness of at least three-eights of an inch, except that ten-inch and twelve-inch piles may have a shell thickness of five-sixteenths of an inch. Splices of shells shall be of such material and design as to insure alignment of shells and transmission of the load. The ends of each section of the shell shall be perpendicular to its axis and all bearing surfaces shall be smooth and true. The outside diameter of the pile shall be at least one-fortieth of its length. Piles more than 22 inches in diameter shall be considered as caisson piers and regulated by the provisions of Section 707.

Filling Cylindrical Steel Piles

Par. 7052. After driving, the inside of the shell shall be carefully cleaned to the bottom and its direction and cross-section verified. The cross-sectional area shall not vary more than ten per cent. from its original size. Shells shall be filled with concrete having an ultimate strength of at least 2,000 pounds per square inch, and meeting the requirements of Chapters 64 and 66. Concrete shall not be placed in water except upon approval of the Buildings Engineer after submission of detailed specifications for procedure in accordance with the requirements of Paragraph 6673.

Spacing of Concrete-Filled Cylindrical Steel Piles

Par. 7053. The center-to-center spacing of concrete-filled cylindrical steel piles, when driven open-ended, shall be not less than the diameter of the shell plus 10 inches, and not less than 2 feet. When driven with closed ends, the spacing shall be as provided in Paragraph 7048 for cast-in-place concrete piles.

Loads on Concrete-Filled Cylindrical Steel Piles

Par. 7054. The load on a concrete-filled cylindrical steel pile shall not exceed the safe load on the concrete at 25 per cent of the ultimate compressive strength of the concrete plus that on the steel shell at 7500 pounds per square inch, after deducting one-eighth of an inch in thickness from the outside of the tube; nor shall the load carried by the steel exceed one-half of the total load on the pile. If a pile as actually driven is longer than 40 diameters, the limit of the load specified in this Paragraph shall be reduced by a percentage equal to the excess length divided by the diameter. If splices below the upper section are closer than 20 feet, the safe load on the pile shall be reduced 5 per cent for each splice in excess of the number required for twenty-foot spacing.

The load shall not exceed the allowable load determined in accordance with Paragraph 7021. Where it is positively proved by borings that the piles rest upon solid rock of known quality, the allowable bearing value of the rock, instead of the allowable load determined in accordance with Paragraph 7021, may limit the allowable load on the pile.

Cylindrical Steel Piles Supporting Detached Footings

Par. 7055. When a single concrete-filled cylindrical steel pile supports a detached column or footing, as provided in Paragraph 7026, the load shall not exceed two-thirds of the capacity determined by the methods prescribed in Paragraph 7054.

SECTION 706

ROLLED STEEL PILES

General Requirements for Rolled Steel Piles

Par. 7060. Rolled steel piles shall be made from steel complying with the requirements for structural steel as specified in Chapter 63. The minimum thickness of metal shall be three-eighths of an inch. The moment of inertia about the gravity axis parallel with the web shall not be less than one-fourth of the moment of inertia about a gravity axis perpendicular to the web.

Steel piles shall not be driven into cinders containing free sulphur or soils containing acids or other corrosive materials.

Load on Rolled Steel Piles

Par. 7061. Rolled steel piles shall not be loaded in excess of 8000 pounds per square-inch of the right section of the pile, nor in excess of the allowable load specified in Paragraph 7021.

Spacing of Rolled Steel Piles

Par. 7062. The center-to-center spacing of rolled steel piles shall be not less than three times the nominal size.

Protection of Rolled Steel Piles

Par. 7063. Rolled steel piles driven into ground above water level shall be encased in concrete at least 4 inches thick for a distance of at least one foot above and below the ground level.

When such piles are exposed in tide water or other water known to contain acids or other corrosive substances, they shall be encased in concrete at least 4 inches thick for a distance of at least 2 feet below mean low water and 3 feet above mean high water.

SECTION 707

CAISSON PIERS

General Requirements for Caisson Piers

Par. 7070. Where the footings of any building or other structure are supported on piers carried down to a firm foundation by open or pneumatic caissons either with or without enlarged base or bell at the bottom, the method of installation and construction of such caissons shall be such as to provide for accurate preparation and inspection of their bottoms and to insure sound concrete or other masonry.

Caisson piers shall have a minimum diameter of 2 feet and their bases shall be designed so that they will bear uniformly on the same kind of material and so that the allowable bearing value of the material on which they bear is not exceeded, except that the allowable bearing value on hard bed rock may be increased above the stated values in Paragraph 7012, to equal the unit compression in the caisson pier itself, provided that:

1. The surface of such bed rock is substantially level and is prepared in level or benched areas.
2. The loaded area is not to be within 10 feet of a lot line unless it is at least 40 feet below the curb level.
3. Forty-five degrees slopes extending downward from the periphery of the bearing area falls outside of and below any adjoining excavation.

Design of Caisson Piers

Par. 7071. Caisson piers, where constructed of either plain or reinforced concrete, shall be governed by the requirements of Chapters 61, 64, 65 and 66, with the following modifications:

(a) If constructed of plain concrete, the unit compressive stress in the concrete at the least cross-section shall not exceed $0.25f'_c$ nor 850 pounds per square inch. When the height of the caisson pier exceeds 6 times at least horizontal dimension, except where the least horizontal dimension is 6 feet or more, the allowance working stress shall be determined as follows:

$$f' = 0.25\, f'_c \left(1.3 - \frac{H}{20D} \right)$$

in which f' is the reduced allowable working stress in pounds per square inch

f'_c is the ultimate compressive strength of the concrete in pounds per square inch

H is the height of the shaft in feet measured from the top of the bell to cut-off

D is the least horizontal dimension in feet

In no case shall the height exceed 12 times the least horizontal dimension.

(b) If constructed of reinforced concrete, the maximum stress permitted on the gross cross-section, including vertical reinforcement, shall be limited to 1000 pounds per square inch. When spirally reinforced and where the caisson piers are 6 feet or greater in diameter, or where the ratio of height to diameter is twelve to one or less, vertical reinforcement may be omitted.

Caisson Piers Encased by a Steel Shell

Par. 7072. Where a caisson pier is circular and entirely encased in a steel shell with a minimum thickness of three-eighths of an inch, that percentage of shell thickness which corresponds to the strength of the vertical joint of the shell may be considered as the equivalent of an equal volume of the spiral reinforcement required by Paragraph 6563.

Caisson Piers With Belled Footings

Par. 7073. The bell of belled caisson piers shall have a minimum thickness of 4 inches at its edge and the slope of the sides of the bell shall not exceed one foot horizontally for each two feet vertically, unless properly reinforced in accordance with Section 657.

SECTION 708

FOUNDATION LOAD TESTS

General Regulations for Foundation Load Tests

Par. 7080. Whenever there is doubt as to the bearing capacity of soil or the sustaining capacity of piles, or should application be made for permission to impose upon the soil or piles loads in excess of those specified in this Chapter, the Buildings Engineer may require tests to be made to enable him to determine such loads as will not cause dangerous settlements. The loads so determined shall be taken as the allowable loads.

The proposed testing apparatus and specifications of the procedure must receive the approval of the Buildings Engineer before they are used. Loads shall be applied by direct weight or by means of hydraulic jack pressure that is automatically maintained constant. Tests shall be made under the supervision of the Buildings Engineer and at the expense of the owner of the proposed structure. Settlement readings shall be referred to a bench mark established at a sufficient distance from the test to be unaffected by it and they shall be made by a method which assures accuracy to the degree hereinafter specified.

Load Tests of Bearing Material

Par. 7081. When making load tests of bearing materials, the loaded area shall be not less than one square foot and shall not exceed the area of the footing.

A test load shall be applied which will produce a unit pressure equal to that for which the proposed foundations are designed. This load shall be allowed to remain undisturbed until no measurable settlement occurs during a period of 24 hours. The load shall then be doubled in increments not exceeding 25 per cent of the design load. At least 4 hours shall elapse between the applications of successive increments. The total load shall be allowed to remain undisturbed until no measurable settlement occurs during a period of 24 hours.

Measurements of settlement shall be accurate to one thirty-second inch and shall be taken and recorded every hour during the first 4 hours after the application of each increment, and at least once every 12 hours thereafter.

When the design load upon bearing materials other than medium and soft clay causes settlement of less than three-eighths inch and twice the design load causes settlement of less than one inch, the design load shall be allowed; but if medium or soft clay underlies these materials the vertical pressure in such clay shall not exceed four tons and one ton per square foot, respectively.

Pile Loading Test

Par. 7082. A pile to be tested shall be loaded to at least twice the proposed working load, the load being applied in increments of not over 10,000 pounds. Sufficient time to permit complete measurable settlement shall elapse between the additions of successive increments. Measurements of the settlement, accurate to one thirty-second inch, shall be taken and recorded immediately before and after each increment of load is added. In determining the settlement, proper deduction shall be made for elastic compression of the pile under the test load.

The allowable pile load shall not exceed one-half of that causing a total net settlement of one-half inch, or less, which remains constant for 48 hours, but the load on the bearing materials at the level of the points or upon any lower stratum shall not exceed the bearing values specified in Section 701.

SECTION 709

FOOTINGS

General Regulations for Footings

Par. 7090. The footings of walls, piers and columns shall be of plain or reinforced concrete, stone, brick, or other approved masonry units, or steel grillages, except that footings of wood may be used as hereinafter permitted.

Footings shall not be placed on frozen soil nor shall they be laid in freezing weather unless adequately protected.

Where footings are supported at different levels, or at different levels from footings of adjacent structures, foundation plans shall include vertical sections showing to true scale all such variations in elevation. The effect of such differences in footing levels on the bearing materials shall be considered in the design.

The footings and grade beams of permanent structures, except when founded on rock, and except as otherwise herein provided, shall be carried down at least 3 feet below an adjoining surface exposed to natural or artificial freezing. Where artificial freezing occurs the depth shall be increased one foot for each 10 degrees Fahrenheit below zero.

Footings of detached garages or similar accessory structures of 650 square feet or less in area and not over one story high, and grade beams of all structures need not be carried more than one foot below an adjoining surface exposed to freezing if the underlying soil to a depth of at least 3 feet beneath the surface is clean sand and gravel.

Design of Footings

Par. 7091. Footings shall be designed to distribute to the supporting foundation all loads and lateral forces, as specified in Paragraph 7005, without exceeding the allowable stresses specified in Part VI.

The weight of the footings and overlying fill and floors shall be included in the dead load.

Concrete Footings

Par. 7092. The thickness of plain concrete footings shall be not less than twice their maximum projection.

Footings of reinforced concrete shall be designed in accordance with Section 657.

Stone Footings

Par. 7093. Stone footings shall be of a thickness equal to at least twice their maximum projection. No offset of a stepped footing shall exceed one-half of the rise, and no stone shall be less than 10 inches thick, and shall be fully bedded. Stresses in footing stones shall not exceed those allowed in Paragraph 6104.

Brick Footings

Par. 7094. Brick footings shall be constructed of hard burned brick and shall have a thickness equal to at least twice their maximum projection. Bricks in footings shall be laid in full beds of mortar and fully bonded every other course. Compressive stresses shall not exceed those allowed in Paragraph 6104.

Footings of Other Masonry Units

Par. 7095. Other masonry units used for footings shall be solid and laid in accordance with the requirements for brick footings. The stresses shall not exceed those allowed in Paragraph 6104.

Steel Grillage Footings

Par. 7096. Grillages of structural steel beams used for footings shall be constructed in accordance with Chapter 63. All beams shall be entirely embedded in and surrounded by concrete at least 4 inches thick except below the steel, where it shall be at least 6 inches thick.

Wooden Footings

Par. 7097. Timber in wooden footings shall be not less than 4 inches in the least dimension. Such timber shall be creosoted as required in Section 627 or the top thereof shall be placed entirely below the lowest ground water or other water level, or not more than 18 inches above mean low tide.

Pile Caps

Par. 7098. Piles supporting building of Types A to E, inclusive, shall be capped with concrete proportioned for an ultimate strength of at least 2000 pounds per square inch, or with block granite.

Concrete capping shall extend not less than 12 inches above the pile heads and shall fill the space between and around the piles for a depth of at least 3 inches. The minimum horizontal distance from the edge of the cap to the nearest pile surface shall be 3 inches and there shall be at least 2 inches of concrete between the top of a pile and steel reinforcement.

Block granite capping shall be not less than 12 inches thick. Each block shall have a bearing on at least 2 piles and shall be bedded in cement mortar applied to the pile heads. The capping blocks shall be sufficiently large to cover all pile heads.

Wooden capping in contact with the ground, or not otherwise readily available for inspection, shall be creosoted as required in Section 627, or the top thereof shall be placed below the lowest ground water or other water level or not more than 18 inches above mean low tide.

If the distance between lateral supports, as required by Paragraph 7027, for walls supported by a single row of piles exceeds 10 feet, the capping shall be continuous and shall consist of a structural steel grillage, or reinforced concrete at least 2 feet wide in which the area, in square inches, of longitudinal steel reinforcement near each vertical face is at least one-eighth the length, in feet, between lateral supports.

CHAPTER 71

SOLID MASONRY WALLS

Sec. 710—General Requirements for Solid Masonry Walls.
Sec. 711—Design of Solid Masonry Walls.
Sec. 712—Thickness of Solid Masonry Walls.
Sec. 713—Bonding Solid Masonry Walls.
Sec. 714—Construction of Solid Masonry Walls.
Sec. 715—Openings in Solid Masonry Walls.
Sec. 716—Chases and Recesses in Solid Masonry Walls.
Sec. 717—Connecting New Solid Masonry to Old Masonry Walls.
Sec. 718—Reinforced Brick Walls.
Sec. 719—Use of Existing Solid Masonry Walls.

SECTION 710

GENERAL REQUIREMENTS FOR SOLID MASONRY WALLS

Scope of Solid Masonry Walls

Par. 7100. Solid masonry walls shall include all walls, buttresses, pilasters and piers constructed of solid masonry units, reinforced brick, or plain concrete without hollow spaces, except chimneys.

For footings of solid masonry walls, refer to Section 709.

SECTION 711

DESIGN OF SOLID MASONRY WALLS

General Requirements for the Design of Solid Masonry Walls

Par. 7110. The effect of eccentricity of loading on the compressive stress of masonry walls shall be ascertained from computations based upon the following assumptions:

1. The maximum moment within any story height is equal to the vertical load of the floor next above, multipled by the eccentricity of its line of action.
2. The wall behaves as if it were not continuous at each floor level.
3. The masonry, except reinforced brick masonry, is incapable of resisting tensile stresses.

Stresses in Solid Masonry Walls

Par. 7111. Solid masonry walls shall be so proportioned that the allowable stresses due to combined live, dead, wind and other loads will not exceed the stresses permitted in Paragraph 6104, but no wall shall have a thickness less than that required in Section 712.

Lateral Support of Solid Masonry Bearing Walls

Par. 7112. Solid masonry bearing walls shall be supported laterally by floors, roofs or similar construction, or by crosswalls, pilasters or buttresses, placed at intervals not exceeding 20 times the wall thickness between such supports.

Such wall shall be supported, in addition to the above supports, by crosswalls, spur walls projecting not less than 4 feet or by any other construction having equal resistance to lateral forces and a four-hour fire resistive rating, spaced not over 100 times the thickness of the wall or more than 10 times the thickness of the wall from each free standing end thereof.

Pilasters or buttresses serving as lateral supports shall project not less than 4 inches for the uppermost 10 feet of the wall and the projection shall be increased 4 inches for each additional 10 feet below. The width of such pilasters and buttresses shall be not less than the thickness of the wall.

Struts having a four-hour fire-resistive rating space not over 20 times the wall thickness may be used instead of floors or roofs for lateral support.

Lateral Support of Solid Masonry Non-Bearing Walls

Par. 7113. Solid masonry non-bearing walls shall be supported laterally by floors, roofs or similar construction, or by crosswalls, pilasters or buttresses, placed at intervals not exceeding 36 times the wall thickness between such supports, or at a distance not exceeding 10 times the wall thickness from the free standing end or top of such walls.

Every such wall shall also be supported by crosswalls, pilasters or buttresses spaced not more than 100 times the thickness of the wall or more than 10 times the thickness of the wall from each free standing end thereof.

Pilasters and buttresses serving as lateral supports shall be as required for bearing walls in Paragraph 7112.

Struts having a four-hour fire-resistive rating spaced not over 30 times the wall thickness may be used instead of floors or roofs for lateral support.

Floors and Roofs Used as Lateral Supports for Solid Masonry Walls

Par. 7114. Where floors or roofs are used as lateral supports for solid masonry walls, the floor beams or joists nearest and parallel to the wall shall be anchored to the wall by metal anchors at least one inch by three-eights inch in size, spaced not over 6 feet on centers and embedded at least 4 inches in the wall. Where the floor or roof is supported on wooden, steel or other joists, such anchors shall be attached to at least three joists.

Solid Masonry Walls Subjected to Lateral Forces

Par. 7115. Solid masonry walls, piers and buttresses or pilasters subjected to lateral forces from arches, roof structures, wind, earth, or from other loads, shall be designed to resist such forces so that the maximum allowed stresses in the masonry will not be exceeded.

SECTION 712

THICKNESS OF SOLID MASONRY WALLS

General Requirements for the Thickness of Solid Masonry Walls

Par. 7120. The minimum thickness required in this Section shall mean the thickness of the rough wall exclusive of plaster and furring.

The thickness of walls constructed of rubble stone shall be at least 4 inches more than that required in this Section, but no such stone wall shall be less than 16 inches thick, except that stone walls less than 4 feet in total height shall be not less than 12 inches thick.

Where membrane waterproofing is applied vertically in a wall, its thickness shall be measured on one side of the membrane only.

The thickness of a solid masonry wall in any story shall be not less than that of the wall which it supports in the next story above.

To determine its thickness, the height of a solid wall shall be measured from the top of roof beams, joists or rafters, or the top of the wall downward to the top of the footing. For walls with slanting tops or gables, the height determining the thickness shall be the average height between two vertical lateral supports.

Thickness of Exterior Bearing Walls of Solid Masonry

Par. 7121. The minimum thickness of exterior bearing walls of solid masonry shall be 12 inches for the uppermost 40 feet of wall, and for each additional 40 feet of height or fraction thereof measured downward, the minimum thickness of the wall shall be increased 4 inches, except as follows:

a. The uppermost 15 foot high section of any such wall supporting only a roof may be 8 inches in thickness, but shall be included in measuring the uppermost 40 feet of the wall.

b. Such walls not over 18 feet high of one story buildings without basements may be 8 inches thick if supported laterally by pilasters, buttresses or crosswalls spaced not more than 25 feet apart.

c. The uppermost 30 foot section of such walls of two story buildings in which the live load on the second floor does not exceed 75 pounds per square foot may be 8 inches thick, if such walls are supported by crosswalls, pilasters or buttresses spaced not more than 30 feet apart. The thickness of the walls below such top section shall be not less than 12 inches.

d. The minimum thickness of such walls supported laterally by buttresses may be reduced by not more than half the projection of such buttresses, provided that the clear distance between them does not exceed 20 times the reduced thickness, and that the thickness of the buttresses is not less than one-eighth of the clear distance between them. In no case, however, shall such walls be less than 8 inches thick.

Thickness of Interior Bearing Walls of Solid Masonry

Par. 7122. The minimum thickness of interior bearing walls of solid masonry shall be 8 inches for the uppermost 20 feet of wall, and this minimum thickness shall be increased 4 inches for each additional 40 feet of height or fraction thereof, measured downward, except as follows:

a. The uppermost 30 foot section of such walls in two story buildings in which the live load in the second floor does not exceed 75 pounds per square foot may be 8 inches thick, if supported by crosswalls, pilasters or buttresses spaced not over 30 feet apart. The thickness of the walls below such section shall be not less than 12 inches.

b. The minimum thickness of such walls supported laterally by buttresses may be reduced by not more than half the projection of such buttresses, provided that the clear distance between them does not exceed 20 times the reduced thickness, and that the thickness of the buttresses is not less than one-eighth of the clear distance between them. In no case, however, shall such walls be less than 8 inches thick.

Thickness of Exterior Non-Bearing Walls of Solid Masonry

Par. 7123. The minimum thickness of exterior non-bearing walls of solid masonry shall be 8 inches for the uppermost 20 feet of height and the minimum thickness shall be increased 4 inches for each additional 40 feet or fraction thereof measured downward, except that in two-story buildings, the uppermost 30 foot section may be 8 inches thick if such walls have vertical lateral supports spaced not over 30 feet apart and if the wall thickness is increased to at least 12 inches below such section in walls more than 30 feet high.

Thickness of Interior Non-Bearing Walls of Solid Masonry

Par. 7124. The thickness of interior non-bearing walls of solid masonry shall be governed by the spacing of their lateral supports required in Paragraph 7113.

Thickness of Panel Walls of Solid Masonry

Par. 7125. The minimum thickness of exterior panel walls of solid masonry shall be 8 inches for panels not exceeding 20 feet in height or 30 feet in length.

Larger panels and interior panel walls shall be considered non-bearing walls.

Dimensions of Solid Masonry Piers

Par. 7126. The minimum dimension of solid masonry piers including wall sections whose length is not more than 4 times their thickness shall be one-tenth of the unsupported height.

Thickness of Foundation Walls of Solid Masonry

Par. 7127. The thickness of foundation walls of solid masonry for the first 10 feet of depth measured downward from the ground level shall be as follows:

Rubble stone foundation walls, not less than 16 inches.

Brick foundation walls, except reinforced brick walls, not less than 8 inches for the uppermost three feet, and 12 inches for the balance.

Concrete foundation walls, not less than 10 inches, except that for walls not over 4 feet in total height of buildings without basements, it shall be not less than 6 inches.

Each additional 10 foot section, or fraction thereof, in the depth of a foundation wall shall be 4 inches thicker than the section of wall immediately above.

Reinforced brick foundation walls shall be not less than 8 inches thick.

Thickness of Solid Masonry Parapet Walls

Par. 7128. The minimum thickness of solid masonry parapet walls shall be 12 inches, except that for walls 3 feet or less in height the thickness may be 8 inches.

Where the height of such walls exceeds 10 times their thickness, they shall be supported laterally by pilasters or buttresses as required in Paragraph 7113.

Thickness of Fire Walls

Par. 7129. The minimum thickness of fire walls shall be in accordance with Section 598.

SECTION 713

BONDING SOLID MASONRY WALLS

General Requirements for Bonding

Par. 7130. The bonding or tying in of the individual masonry units shall be accomplished by overlapping of the various units both longitudinally along the wall and by headers laid across the wall in such a manner as to make the entire structure act as a unit in resisting force, except as permitted for grouted walls in Paragraph 7131.

A bond as required by this Code shall be made by overlapping approximately one-half the area of one unit over other units.

Bonding of Solid Brick Walls

Par. 7131. In solid brick walls, except as hereinafter permitted, there shall be at least one header in each face for every 200 square inches of wall surface, but the vertical and horizontal spacing of the headers shall not exceed 18 inches center to center. In walls more than 12 inches thick the headers from the opposite faces shall form a continuous tie by placing additional headers inside the wall overlapping the other headers at least 2 inches.

Where secret headers are used for bonding face brick, there shall be at least one such header for every 100 square inch of wall surfaces and their horizontal and vertical spacing shall not exceed 14 inches center to center.

The headers may be omitted in walls consisting of two or more wythes, each at least three and three-quarter inches thick, spaced approximately one inch apart, with such space and all interior joints filled with grout consisting of one part of Portland cement and not more than 3 parts of sand, to which lime may be added not exceeding 15 per cent of the cement by volume.

Bonding of Solid Cut Stone Walls

Par. 7132. In solid walls of cut stone, bonding headers shall be spaced not more than 24 inches vertically and horizontally, or every other course.

Such bond stones shall be not less in size than the average size stone used in the wall.

Bonding of Solid Concrete Block Walls

Par. 7133. Bonding of solid concrete block walls or walls of other precast units shall be the same as required for walls of cut stone, in Paragraph 7132.

Bonding of Rubble Masonry

Par. 7134. Rubble stone walls shall have not less than one header extending entirely through the wall for every six square feet of wall surface, except that each header may consist of two stones, if one overlaps the other one-half the length of a stone. Header stones shall be not less than 16 inches in length, 6 inches in thickness, and 8 inches in width, except that in walls 12 inches thick, the length shall be at least 12 inches.

Bonding of Solid Masonry Walls at Intersections

Par. 7135. Exterior walls, walls enclosing vertical shafts and all bearing walls of solid masonry in a building shall be securely bonded or anchored to each other at the intersections. Where anchors are used, there shall be at least one anchor for each 4 feet of the height and they shall be of structural metal not less than one and one-half by one-quarter inches in size, having a length of at least 16 inches in each wall.

Bonding of Solid Pilasters and Buttresses

Par. 7136. The bonding of pilasters and buttresses of solid masonry walls shall be as required for the walls.

Pilasters projecting not more than 12 inches from the face of the wall shall be constructed as part of the wall. Other pilasters or buttresses shall be considered intersecting walls.

Bonding of Piers

Par. 7137. Solid masonry piers shall be completely bonded at least every 12 inches of their height or in every other course.

Anchoring of Panel Walls

Par. 7138. Panel walls in steel or concrete framing shall be anchored by a continuous flange not less than 3 inches wide or by metal anchors not less than 0.50 square inch in cross-section spaced not more than 2 feet on centers around the perimeter of the wall.

SECTION 714

CONSTRUCTION OF SOLID MASONRY WALLS

General Requirements for Construction of Solid Masonry Walls

Par. 7140. Solid masonry walls shall not be permitted to be laid when the temperature is below 32 degrees Fahrenheit, except by special permission from the Buildings Engineer, if means are provided to prevent the mortar from freezing before setting.

For construction of poured concrete walls, refer to Section 613 and Paragraph 6569.

Construction of Solid Brick or Masonry Block Walls

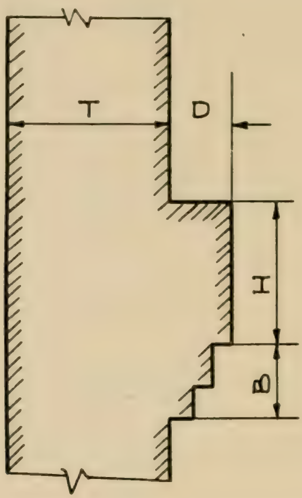
Par. 7141. The brick or masonry blocks in all solid walls shall be laid in full beds of mortar and the vertical joints shall be completely filled with mortar for the full thickness of the wall. The mortar shall be applied before the initial set commences.

Construction of Rubble Stone Walls

Par. 7142. All stone in rubble stone walls shall extend at least 6 inches into the wall. All joints shall be completely filled with mortar.

Corbels on Solid Masonry Walls

Par. 7143. Corbels on solid masonry walls constructed to furnish bearing surface for joists, beams or other structural members shall be constructed as shown in the following sketch:



in which the dimensions shall be governed by the following:

D shall be not more than ¼T
H shall be not less than 4D
B shall be not less than 2D

Corbels shall not be permitted on any wall 8 inches or less in thickness.

Beam Supports in Solid Masonry Walls

Par. 7144. Where beams, joists, and other structural members project into solid masonry walls, there shall be at least 4 inches of solid masonry between the end of such member and the opposite face of the wall.

Where combustible structural members enter a wall from both sides, there shall be at least 4 inches of solid masonry between such members.

Solid Masonry Parapet Walls

Par. 7145. All parapet walls shall be capped with coping of tile, solid masonry blocks or other approved incombustible material.

SECTION 715

OPENINGS IN SOLID MASONRY BEARING WALLS

Openings in Solid Masonry Bearing Walls

Par. 7150. When the total horizonal section of openings exceeds 50 per cent of the gross sectional area of a solid masonry bearing wall in the same plane, the minimum required thickness of the wall shall be increased 4 inches for each additional 15 per cent or fraction thereof of the openings in excess of the 50 per cent, but such openings shall never exceed 80 per cent of the total sectional area of the wall.

Solid Masonry Mullions

Par. 7151. Solid masonry mullions or the portion of a wall between two openings shall not exceed the limit set in Paragraph 7126, Masonry Piers.

Lintels and Arches in Solid Masonry Walls

Par. 7152. All openings in solid masonry walls shall be provided with lintels or arches which will safely support all superimposed loads.

Lintels shall have a bearing at each end on the masonry of not less than one-half inch for each foot of span but never less than 4 inches.

Masonry arches shall be designed in accordance with the accepted theory of arches but shall never be less in thickness than one inch for each foot of span.

SECTION 716

CHASES AND RECESSES IN SOLID MASONRY WALLS

Scope of Chases and Recesses in Solid Masonry Walls

Par. 7160. This section includes all chases provided for pipes, ducts, conduits, wooden nailing strips, and similar purposes, and all recesses provided for stairs, elevators, ramps, alcoves and similar purposes. Wooden nailing strips shall not be construed to mean wooden lathes placed in joints.

Recesses and Minimum Thickness of Walls

Par. 7161. In measuring the required minimum thickness of a wall, chases and recesses may be disregarded if they are constructed as permitted in this section.

Chases in Solid Masonry Walls

Par. 7162. Chases shall be permitted only in walls more than 8 inches in thickness.

Chases shall not be permitted within the required area of any pier or buttress.

Chases shall not be deeper than one-third of the total thickness of the wall.

Horizontal chases and the horizontal projection of sloping chases shall not exceed 4 feet in length, and there shall be at least 8 inches between the ends of chases.

Vertical chases shall not be closer than 2 feet to any wall pier, buttress or cross wall.

Recesses for Stairs and Elevators in Solid Masonry Walls

Par. 7163. The thickness of the walls behind recesses for stairs and elevators shall never be less than the required thickness of the wall 50 feet above the bottom of the recess, but never less than 12 inches, unless the wall behind the recesses is reinforced with additional piers, steel or reinforced concrete columns spaced not over 20 times the thickness of the remaining wall back of the recess.

Other Recesses in Solid Masonry Walls

Par. 7164. Recesses for alcoves and similar purposes shall not exceed 8 feet in width.

The thickness of the remaining wall behind such recesses shall be not less than half the thickness of the wall nor shall it be less than 8 inches in exterior walls.

The wall above the recess shall be supported by arches or lintels.

Aggregate Area of Chases and Recesses

Par. 7165. The combined area of chases, recesses and all openings in a wall shall not exceed the total permissible area of openings in that wall.

Firestopping of Chases

Par. 7166. Chases shall be firestopped at every floor level, as required in Paragraph 5916.

SECTION 717

CONNECTING NEW SOLID MASONRY TO OLD MASONRY WALLS

Solid Walls Built upon Existing Walls

Par. 7171. No solid masonry wall shall be built upon an existing masonry wall of lower bearing capacity or of lower fire-resistiveness.

Anchoring Solid Masonry Walls to Existing Walls

Par. 7172. New walls on new footings subject to settlement and connecting to existing walls shall be anchored to the walls by a continuous metal angle not smaller than 3 inches by 3 inches by five-sixteenths of an inch, fastened to the old wall with five-eights inch diameter bolts not more than 3 feet on centers throughout the height of the wall.

If a new wall is supported on existing footings or overlaps portions of another wall, it shall be bonded to the old wall as required for new solid masonry.

SECTION 718

REINFORCED BRICK WALLS

Construction of Reinforced Brick Walls

Par. 7181. In reinforced brickwalls there shall be at least one header in each face for every 100 square inches of wall surface, but the horizontal and vertical spacing of the headers shall not exceed 14 inches. All bed, end and wall joints shall be completely filled with Portland cement mortar or grout or both, and all reinforcing steel shall be entirely embedded in such mortar or grout. The joints shall be equal to at least twice the diameter of the largest reinforcement imbedded in them.

The grout used in such walls shall consist of one part of Portland cement and not more than three parts of sand, to which lime may be added not exceeding 15 per cent of the cement by volume.

The headers may be omitted in walls consisting of two or more wythes each at least three and three-quarter inches thick spaced approximately one inch apart, with such space and all interior joints filled with grout.

SECTION 719

USE OF EXISTING SOLID MASONRY WALLS

Permit for Use of Existing Walls

Par. 7190. Existing solid masonry walls shall not be used or altered for use in new buildings unless they meet all the requirements of this Chapter and unless their condition is satisfactory.

Increasing the Height of Solid Masonry Walls

Par. 7191. The height of existing solid masonry walls shall not be increased beyond the limit set in Section 712.

Increasing the Thickness of Solid Masonry Walls

Par. 7192. Where an existing wall is desired to be strengthened by increasing its thickness, the wall shall be lined with a new wall not less than 8 inches in thickness. Such new walls shall be bonded to the old wall by not less than one full header in every 4 square feet of wall area or by metal ties having one-fourth square inch in area for every 6 square feet of wall area.

Where such lining is impractical, the wall shall be rebuilt to the required thickness.

CHAPTER 72

HOLLOW MASONRY WALLS

Sec. 720—General Requirements for Hollow Masonry Walls.
Sec. 721—Design of Hollow Masonry Walls.
Sec. 722—Minimum Thickness of Hollow Masonry Walls.
Sec. 723—Bonding of Hollow Masonry Walls.
Sec. 724—Construction of Hollow Masonry Walls.
Sec. 725—Openings in Hollow Masonry Walls.
Sec. 726—Chases and Recesses in Hollow Masonry Walls.
Sec. 727—Bonding Hollow Masonry Walls to Existing Walls.
Sec. 729—Use of Existing Hollow Masonry Walls.

SECTION 720

GENERAL REQUIREMENTS FOR HOLLOW MASONRY WALLS

Scope of Hollow Masonry Walls

Par. 7200. Hollow masonry walls shall include all walls, buttresses, pilasters and piers constructed of hollow masonry units, constructed hollow of solid masonry units, or of cellular poured concrete.

For the footing of hollow masonry walls, refer to Section 709.

SECTION 721

DESIGN OF HOLLOW MASONRY WALLS

General Requirements for the Design of Hollow Masonry Walls

Par. 7210. The effect of eccentricity of loading or the compressive stress of masonry walls shall be ascertained from computations based on the assumption stated in Paragraph 7110.

Stresses in Hollow Masonry Walls

Par. 7211. Hollow masonry walls shall be so proportioned that the allowable stresses due to combined live, dead, wind and other loads will not exceed the stresses permitted in Chapter 61, but no wall shall have a thickness less than that required in Section 722.

Lateral Support of Hollow Masonry Bearing Walls

Par. 7212. Hollow masonry bearing walls shall be supported laterally by floors, roofs or similar construction, or by crosswalls, pilasters or buttresses placed at intervals not exceeding 20 times the wall thickness between such supports.

Such walls shall be supported, in addition to above supports, by cross walls, spur walls projecting not less than 4 feet or by any other construction having equal resistance to lateral forces and a four-hour fire resistive rating, spaced not over 80 times the wall thickness.

Pilasters or buttresses serving as lateral supports shall project not less than 4 inches for the uppermost 10 feet of the wall and the projection shall be increased 4 inches for each additional 10 feet below. The width of such pilasters and buttresses shall be not less than the thickness of the wall.

Struts having a four-hour fire-resistive rating, spaced not over 20 times the wall thickness may be used instead of floors or roofs for lateral support.

Lateral Support of Hollow Masonry Non-Bearing Walls

Par. 7213. Hollow masonry non-bearing walls shall be supported laterally by floors, roofs or similar construction, or by crosswalls, pilasters or buttresses placed at intervals not exceeding 30 times the wall thickness between such supports, or at a distance not exceeding 8 times the wall thickness from the free standing end or top of such walls.

Every such wall shall also be supported by crosswalls, pilasters or buttresses spaced not more than 80 times the thickness of the wall or more than 10 times the thickness of the wall from each free standing end thereof.

Pilasters and buttresses serving as lateral supports shall be as required for bearing walls in Paragraph 7212.

Struts having a four-hour fire-resistive rating, spaced not over 20 times the wall thickness, may be used instead of floors or roofs for lateral support.

Floors and Roofs Used as Lateral Support for Hollow Masonry Walls

Par. 7214. Floors and roofs used as lateral supports for hollow masonry walls shall be anchored thereto as required in Paragraph 7114 for solid walls.

Hollow Masonry Walls Subjected to Lateral Forces

Par. 7215. Hollow masonry walls, piers and buttresses subjected to lateral forces from arches, roof structures or wind shall be designed to resist such forces.

Hollow masonry walls shall not be used to resist earth or hydrostatic pressure, or in contact with soil, except as permitted in Paragraph 7216.

Foundation Walls of Hollow Masonry

Par. 7216. Foundation walls of hollow masonry shall be permitted only for buildings not over two stories in height and not over 2000 square feet in area, under the following conditions:

a. The height of such walls from the basement or cellar floor to the floor above shall be not more than 8 feet.

b. The height of earth retained by such walls shall be not more than 6 feet.

c. The thickness of such walls shall be not less than 12 inches, plus ¾ inch of parging with cement mortar applied on the outside of the wall in contact with earth.

d. The walls shall be constructed of hollow blocks, made of concrete with stone coarse aggregate and having a shell thickness of not less than one and three-quarter inches, or structural load-bearing clay tile laid on side, or of brick.

SECTION 722

MINIMUM THICKNESS OF HOLLOW MASONRY WALLS

General Requirements for the Thickness of Hollow Masonry Walls

Par. 7220. The minimum thickness required in this Section shall mean the thickness of the rough wall exclusive of plaster and furring.

Where membrane waterproofiing is applied vertically in a hollow wall its thickness shall be measured on one side of the membrane only.

The thickness of a hollow masonry wall in any story shall not be less than that of the wall which it supports in the next story above.

The height of a hollow wall determining its thickness shall be measured from the top of the roof, beams or rafters, or the top of the wall, downward to the top of the solid foundation wall or footing. For walls with slanting tops or gables, the height determining the thickness shall be the average height between two vertical lateral supports.

Thickness of Hollow Bearing Masonry Walls

Par. 7221. The minimum thickness of hollow bearing walls constructed of hollow or solid masonry units shall be 12 inches for the uppermost 30 feet and this minimum thickness shall be increased 4 inches for each additional 30 feet of height or fraction thereof measured downward, except as follows:

a. The uppermost 10-foot-high section of any such bearing wall may be 8 inches in thickness, but shall be included in measuring the uppermost 30 feet of the wall.

b. Such walls not over 16 feet high of one story buildings may be 8 inches thick, if supported laterally by pilasters, buttresses or crosswalls spaced not over 25 feet apart.

c. The uppermost 20 foot section of such walls of two story buildings in which the live load on the second floor does not exceed 60 pounds per square foot may be 8 inches thick, if such walls are supported by crosswalls, pilasters or buttresses spaced not more than 25 feet apart, but the height of such section shall be included in measuring the uppermost 30 feet of the wall.

d. The uppermost 30 foot section of such walls when used as party walls between buildings not over 2 stories in height and not over 2000 square feet in area may be 8 inches thick. The thickness of the walls below such section shall be not less than 12 inches.

Thickness of Exterior Non-Bearing Hollow Masonry Walls

Par. 7223. The minimum thickness of exterior non-bearing and curtain walls of hollow masonry units or constructed hollow of solid masonry units, shall be 8 inches for the uppermost 20 feet of wall and shall be increased 2 inches for each additional 15 feet of height below this uppermost section.

Thickness of Interior Non-Bearing Hollow Masonry Walls

Par. 7224. The thickness of interior non-bearing hollow walls shall be governed by the spacing of their lateral supports required in Paragraph 7213.

Thickness of Cellular Poured Concrete Walls

Par. 7225. The minimum thickness of plain concrete walls poured monolithically with airspaces in the wall shall be as required in Paragraphs 7221, 7223 and 7224 for walls of hollow masonry units.

Thickness of Hollow Masonry Panel Walls

Par. 7226. Exterior panel walls constructed of hollow units shall be at least 8 inches thick for panels not exceeding 15 feet in height and 20 feet in length.

Other exterior panel walls and interior panel walls shall be considered non-bearing walls.

Thickness and Height of Hollow Walls Superimposed on Solid Walls

Par. 7227. The thickness of a hollow wall constructed on top of a solid wall shall be determined by the requirements for hollow walls. The total height of such combination walls shall not exceed the height permitted for solid walls of the same thickness.

Dimensions of Hollow Masonry Piers

Par. 7228. Isolated piers of hollow masonry shall have no dimension less than one-tenth their unsupported height.

Thickness of Hollow Masonry Parapet Walls

Par. 7229. All parapet walls of hollow masonry shall be at least 8 inches thick.

Parapet walls of hollow masonry shall not be higher than 8 times their thickness unless supported laterally by pilasters or buttresses as required in Paragraph 7213.

SECTION 723

BONDING OF HOLLOW MASONRY WALLS

Scope of Bonding of Hollow Masonry Walls

Par. 7230. This section includes the requirements for bonding of hollow walls and piers constructed of solid masonry units or of hollow masonry units. Included in this Section is also the bonding of hollow masonry walls at intersections.

Bonding of Hollow Walls of Solid Masonry Units

Par. 7231. In hollow walls constructed of solid brick, except as hereinafter permitted, there shall be at least one header in each face for every 100 square inches of wall surface, but the vertical and horizontal spacing of such headers shall not exceed 14 inches center to center.

The bonding header shall overlap the face course below at least 2 inches and in walls more than 12 inches thick, the headers from the opposite faces shall form a continuous tie by placing additional headers inside the wall overlapping the other headers 2 inches.

In walls consisting of two wythes of brick masonry, each at least three and three-quarter inches thick, spaced about 2 inches apart, the headers may be omitted if the wythes are bonded with metal anchors. Such anchors shall be spaced not over six courses apart vertically and not more than two feet horizontally, and shall be not less than 0.05 square inches in cross-sectional area with no dimension less than one-eighth inch. They shall be protected against corrosion, and where lime is used in the mortar, such protection shall be cement grout.

Bonding of Walls of Hollow Masonry Units

Par. 7232. In all walls built of hollow clay tile, hollow concrete or cinder blocks, each unit shall break joints with the next above.

Where the walls are more than one unit in thickness at least every fourth course shall be a bonding course in each face, but the distance between such header courses shall not exceed 30 inches, measured between the center lines.

Bonding of Hollow Masonry Walls at Intersections

Par. 7233. Exterior walls, walls enclosing vertical shafts and all bearing walls of hollow masonry in a building shall be securely bonded or anchored to each other at the intersections. Where anchors are used, there shall be at least one anchor for each 4 feet of the height and they shall be of structural metal not less than one and one-half by one-quarter inches in size, having a length of at least 16 inches in each wall.

Bonding of Pilasters and Buttresses of Hollow Masonry

Par. 7234. All pilasters and buttresses of hollow masonry shall be bonded as required for hollow masonry walls.

Pilasters projecting not more than 12 inches from the face of a wall shall be constructed as part of the wall. Other pilasters and buttresses projecting from walls shall be considered intersecting walls.

Bonding of Hollow Masonry Piers

Par. 7235. Piers of hollow masonry shall be bonded as required for piers of solid masonry in Paragraph 7137.

Anchoring of Hollow Panel Walls

Par. 7236. Hollow panel walls shall be securely fastened to the supporting members, as required in Paragraph 7138 for solid masonry walls.

SECTION 724

CONSTRUCTION OF HOLLOW MASONRY WALLS

General Requirements for the Construction of Hollow Masonry Walls

Par. 7240. The general requirements for the construction of hollow masonry walls shall be the same as those for solid walls in Paragraph 7140.

Construction of Hollow Walls of Solid Masonry Units

Par. 7241. The total area of voids in any horizontal section of a hollow wall constructed of solid units shall not exceed 40 per cent of the gross area of the wall in the same section.

The wall shall be constructed solid for at least two courses immediately below such levels where the thickness of wall decreases.

All solid masonry units in hollow walls shall be laid up with joints completely filled.

The mortar shall be applied before the initial setting commences.

Construction of Walls of Hollow Masonry Units

Par. 7242. In walls constructed of hollow masonry units, the units immediately below the level of decreasing wall thickness shall be filled solid with cement grout or concrete, or shall be covered with a concrete slab at least 2 inches thick.

The joints parallel to the cells of a hollow masonry unit shall be completely filled with mortar and the joints perpendicular to such cells shall be buttered joints.

The mortar shall be applied before the initial setting commences.

Construction of Cellular Concrete Walls

Par. 7243. The total area of voids in any horizontal section of a cellular concrete wall shall be not more than 40 per cent of the gross area of the wall in the same section.

The outer shell of such walls shall be reinforced for temperature changes and the volume of the reinforcement shall be at least 2 per cent of the shell volume, both horizontally and vertically.

Corbels on Hollow Masonry Walls

Par. 7244. Corbels built into hollow masonry walls for the purpose of supporting structural members shall be of solid units and shall be constructed as required in Paragraph 7143.

Beam Supports in Hollow Masonry Walls

Par. 7245. Trusses, girders, beams, joists and other structural members shall not be seated directly upon hollow masonry units or on hollow walls, but shall be supported on solid masonry, stone, concrete or metal bearing plates, all of sufficient strength and of such construction as to distribute the load over the webs and shells of the units or over the load bearing parts of the wall.

At least 4 inches of clear space shall be maintained between combustible or unprotected steel structural members entering a hollow masonry wall from both faces. The space between the members and a 4-inch space above and at the end of such members shall be solidly filled with masonry materials.

Hollow Masonry Parapet Walls

Par. 7246. All hollow masonry parapet walls shall be capped by a tile coping or other coping of solid masonry materials.

Hollow Masonry Walls under Construction

Par. 7248. The unsupported height of any hollow masonry wall under construction shall be not over 2 stories or 26 feet.

Glass Blocks in Walls

Par. 7249. Partitions and panels of glass blocks shall not exceed 144 square feet in area between horizontal and vertical supports or expansion joints, and the distance between such supports and expansion joints shall not exceed 20 feet. Where an intermediate vertical or horizontal stiffener is provided the area of such panels may be increased to not over 200 square feet but the distance between expansion joints and horizontal supports in such panel shall not be more than 20 feet.

Exterior glass block panels more than 80 square feet in area shall be placed in chases formed in the supporting members at the top and sides or shall be anchored to such members by mechanical means equally effective. Other exterior panels shall be anchored likewise or fastened to the supporting members at the top, bottom and sides by metal ties formed from at least No. 20 U. S. Standard gauge non-corroding metal or galvanized steel. Panels 6 feet or less in height or width need be anchored only on the two long sides. Intermediate stiffeners shall be effectively anchored to the panels. All anchors, ties, stiffeners and supports shall be designed to resist wind pressure and vacuum, as required in Section 605. The expansion joints shall consist of packed oakum, fibrous glass, cork or similar resilient material, not less than one-half inch in thickness, and pointed on both sides with a non-hardening waterproof caulking compound.

SECTION 725

OPENINGS IN HOLLOW MASONRY WALLS

Openings in Hollow Masonry Bearing Walls

Par. 7250. Where the total area of openings in any horizontal section of a hollow bearing wall exceeds 40 per cent of the gross area of the wall in the same section, the required minimum thickness of wall shall be increased 4 inches for each 15 per cent or fraction thereof of the opening's area in excess of the 40 per cent. In no case shall the total area of openings in a horizontal section exceed 75 per cent of the gross area of the wall in the same section.

Hollow Masonry Mullions

Par. 7251. The unsupported height of the portion between two openings in a hollow masonry wall shall be not more than 10 times its least cross-sectional dimension.

No cross-sectional dimension of unreinforced hollow masonry mullions shall be less than 12 inches.

Lintels and Arches in Hollow Masonry Walls

Par. 7252. All openings in hollow masonry walls shall be topped with lintels or arches which will safely support all superimposed loads.

Lintels shall be supported as required for beams in Paragraph 7245.

Masonry arches shall have a rise of at least one inch for each foot of span.

SECTION 726

CHASES AND RECESSES IN HOLLOW MASONRY WALLS

Scope of Chases and Recesses in Hollow Masonry Walls

Par. 7260. This section includes all chases provided for pipes, ducts, conduits, wooden nailing strips and similar purposes, and recesses provided for stairs, elevators, ramps, alcoves and similar purposes.

Wooden nailing strips shall not be construed to mean wooden laths placed in joints.

Measuring the Minimum Thickness of Walls

Par. 7261. In measuring the required minimum thickness of a wall, chases and recesses may be disregarded if they are constructed as permitted in this section.

Chases in Hollow Masonry Walls

Par. 7262. Chases shall not be cut into completed hollow masonry walls but may be built into such walls.

Chases in hollow walls shall in all respects conform to the requirements of Paragraph 7162 for chases in solid walls.

Recesses in Hollow Masonry Walls

Par. 7263. Recesses for stairs, elevators, alcoves and other purposes shall be constructed as required in Paragraphs 7163 and 7164 for recesses in solid masonry walls.

Aggregate Area of Chases and Recesses

Par. 7264. The combined area of chases, recesses and all openings in a wall shall not exceed the total permissible area of openings in that wall.

Firestopping of Chases

Par. 7265. Chases shall be firestopped at every floor level as required in Paragraph 5916.

SECTION 727

BONDING HOLLOW MASONRY WALLS TO EXISTING WALLS

Hollow Walls Built upon Existing Walls

Par. 7271. No hollow masonry wall shall be constructed upon an existing masonry wall of lower bearing capacity or of lower fire-resistiveness.

Anchoring Hollow Walls to Existing Walls

Par. 7272. Hollow walls shall be anchored to existing walls as required in Paragraph 7172 for solid walls.

SECTION 729

USE OF EXISTING HOLLOW MASONRY WALLS

Permit for Use of Existing Hollow Walls

Par. 7290. Existing hollow masonry walls shall not be used or altered for use in new buildings unless they meet all the requirements of this Chapter and unless their condition is satisfactory.

Increasing the Height of Existing Hollow Masonry Walls

Par. 7291. The height of existing hollow masonry walls shall not be increased beyond the limit set in Section 722.

Increasing the Thickness of Hollow Masonry Walls

Par. 7292. Where existing hollow walls are to be strengthened, the construction shall satisfy the requirements of Paragraph 7192, for solid walls.

CHAPTER 73

FACED MASONRY WALLS

Sec. 730—General Requirements for Faced Masonry Walls
Sec. 731—Design of Faced Masonry Walls.
Sec. 732—Minimum Thickness of Faced Masonry Walls.
Sec. 733—Bonding Faced Masonry Walls.
Sec. 734—Constructon of Faced Masonry Walls.
Sec. 735—Openings in Faced Masonry Walls.
Sec. 736—Chases and Recesses in Faced Masonry Walls.
Sec. 737—Bonding Faced Masonry Walls to Existing Walls.
Sec. 739—Use of Existing Faced Masonry Walls.

SECTION 730

GENERAL REQUIREMENTS FOR FACED MASONRY WALLS

Scope of Faced Masonry Walls

Par. 7300. Faced masonry walls include all solid and hollow walls and piers faced or veneered with solid or hollow masonry units or glass, and all walls constructed of more than one kind of masonry materials or units.

Classification of Faced Masonry Walls

Par. 7301. All faced masonry walls shall be classified as either solid or hollow walls.

Masonry walls shall be considered faced solid walls when the volume of the solid units or of the solid masonry exceeds 60 per cent of the total wall volume. All other faced masonry walls shall be considered faced hollow walls.

SECTION 731

DESIGN OF FACED MASONRY WALLS

Stresses in Faced Masonry Walls

Par. 7310. Faced masonry walls shall be so proportioned that the allowable stresses due to combined live, dead, wind and other loads will not exceed the stresses permitted in Chapter 61, but no wall shall have a thickness less than that required in Section 732.

The facing shall not be considered to carry stress, unless it is at least three and three-quarter inches thick and bonded as required in Section 733, in which case the allowable stress in the wall shall be that permitted for the weakest material.

Lateral Support of Faced Masonry Walls

Par. 7311. Faced solid masonry walls shall be supported laterally as required in Paragraph 7112 for solid bearing walls, and in Paragraph 7113 for solid non-bearing walls.

Faced hollow masonry walls shall be supported laterally as required in Paragraph 7212 for hollow bearing walls and in Paragraph 7213 for hollow non-bearing walls.

Refer to Paragraphs 7114 and 7214 for anchoring of floors to walls.

Faced Masonry Walls Subjected to Lateral Forces

Par. 7313. Faced masonry walls, piers and buttresses subjected to lateral forces from arches, roof structures and wind shall be designed to resist such forces.

SECTION 732

MINIMUM THICKNESS OF FACED MASONRY WALLS

General Requirements for the Thickness of Faced Masonry Walls

Par. 7320. The general requirement for thickness of solid faced walls shall be the same as for solid walls in Paragraph 7120.

The general requirements for thickness of hollow faced walls shall be the same as for hollow walls in Paragraph 7220.

Thickness of Facing and Veneer

Par. 7321. Masonry or other materials used for facing or veneering solid or hollow walls shall have a minimum thickness as follows:

Natural Stone	3 inches
Cast Stone	2 inches
Solid Flat Tile	1 inch
Solid Terra Cotta	1¼ inches
Hollow Structural Tile	2 inches
Hollow Terra Cotta	3 inches
Sheet Metal	No. 20 U. S. Gauge
Glass	11/32 inch

In stone ashlar, all stones shall have a reasonably uniform thickness.

Measuring Faced Masonry Walls for Thickness

Par. 7322. The required minimum thickness of faced masonry walls shall not include the plaster or furring.

The facing on walls shall not be included in the required minimum thickness unless such facing is at least three and three-quarter inches thick throughout and bonded to the backing as required in Section 733.

Where membrane waterproofing is applied vertically in a faced wall, the thickness of wall shall be measured on one side of the membrane only.

Thickness of Faced Solid Masonry Walls and Piers

Par. 7323. Faced solid masonry walls and piers shall have a minimum thickness as required in Section 712.

Thickness of Faced Hollow Masonry Walls and Piers

Par. 7324. Faced hollow masonry walls and piers shall have a minimum thickness as required in Section 722.

SECTION 733

BONDING FACED MASONRY WALLS

Scope of Bonding Faced Masonry Walls

Par. 7330. This Section includes the requirements for bonding solid and hollow walls, piers and buttresses faced with solid brick, solid or hollow block, stone or glass veneer. It also includes the bonding of faced masonry walls at intersections.

Bonding Masonry Backing

Par. 7331. The backing in faced masonry walls shall be bonded as required in Sections 713 and 723.

Bonding of Brick Facing to Masonry Walls

Par. 7332. Where brick facing is to be included in the required thickness of the wall or to carry stress, it shall be bonded into the wall by at least one brick in every 200 square inches of wall surface, spaced horizontally and vertically not over 24 inches center to center, and projecting at least three and three-quarter inches into the backing. Otherwise, it shall be either likewise bonded or anchored by substantial non-corroding metal ties, spaced not over one foot apart vertically and two feet apart horizontally, and securely anchored to the facing and backing.

Where the facing is less than 4 inches thick and fastened to the backing by anchors only, such facing shall be also supported by continuous shelf angles spaced vertically not over 14 feet on centers. Such angles shall be securely fastened to the wall or structural framing.

Bonding of Stone Facing to Masonry Walls

Par. 7333. Where stone facing is to be included in the required thickness of the wall or to carry stress, it shall be bonded to the walls by uniformly distributed headers, having no dimension less than 6 inches, projecting at least 6 inches into the backing, with a total cross-sectional area of at least 15 per cent of the wall area. Otherwise, the stone facing shall be either likewise bonded or anchored to the backing by non-corroding metal ties, at least one-quarter inch in thickness or diameter, spaced not over 18 inches vertically and not over 30 inches horizontally. Such ties shall be securely anchored to the facing and backing.

Where the facing is less than 4 inches thick and fastened to the backing by anchors only, such facing shall be also supported by continuous shelf angles spaced vertically not over 14 feet on centers. Such angles shall be securely fastened to the wall or structural framing.

Bonding of Solid or Hollow Block Facing

Par. 7334. Where solid or hollow masonry block facing is to be included in the required thickness of the wall, it shall be bonded to the wall by headers projecting at least 4 inches into the backing, with at least one such header for every 120 square inches. Otherwise such facing shall be either likewise bonded or anchored to the wall by substantial non-corroding metal ties spaced not over one foot apart vertically and not over two feet apart horizontally.

Where the facing is less than 4 inches thick and fastened to the backing by anchors only, such facing shall be also supported by continuous shelf angles spaced vertically not over 14 feet on centers. Such angles shall be securely fastened to the wall or structural framing.

Anchoring of Masonry Veneer

Par. 7335. Solid or hollow tile and terra cotta facing shall be anchored to masonry walls by substantial non-corroding metal ties, spaced not over one foot apart vertically nor over two feet apart horizontally, except where the vertical dimension of the facing units is over 12 inches, in which case the vertical spacing of the anchors shall be not over two feet. All metal ties shall be securely anchored to the facing and backing.

Where the facing is less than 4 inches thick and fastened to the backing by anchors only, such facing shall be also supported by continuous shelf angles spaced vertically not over 14 feet on centers. Such angles shall be securely fastened to the wall or structural framing.

Bonding of Glass Veneer to Masonry Walls

Par. 7336. Glass veneer shall be fastened to the backing by mastic cement and supported on shelf angles or fastenings as follows:

The mastic cement shall be applied only when the backing is thoroughly dry and after an approved bond coat has been thoroughly and uniformly applied to the wall. An asphaltic base mastic cement, or approved equal, shall be used and it shall be applied in gobs to the wall or back surface of the glass veneer. The veneer shall be pressed against the backing with sufficient force to flatten out the gobs to not less than one-quarter inch and not more than five-eighths of an inch in thickness. Sufficient quantity of mastic shall be applied so that not less than 50 per cent of the total area of the glass section is thoroughly cemented to the backing. All joints shall be sealed with a waterproof compound or otherwsie made waterproof.

The shelf angles or other incombustible supports shall be placed starting on a line not higher than 36 inches above the sidewalk level, or they shall be placed under the lowest course when the lowest edge of the veneer is more than 36 inches above the sidewalk level. The shelf angles shall be secured to the backing in a manner satisfactory to the Buildings Engineer, and shall be of not less than 18 U. S. Gauge and not less than 2 inches in length. These angles shall be located, under each section, in every other horizontal joint; however, if two or more courses total to less than 24 inches, the angles may be set at vertical intervals not to exceed 30 inches.

Where glass veneer is applied at an elevation greater than the sills of the second story windows or 15 feet above the level of the sidewalk, fastenings on each vertical and horizontal edge of each section of veneer shall be used instead of shelf angles. Such fastenings shall be secured to the backing by means satisfactory to the Buildings Engineer and shall not be less than 2 inches in length, and of not less than No. 18 U. S.

Gauge. The fastenings shall be so designed as to furnish bearing support and also hold the veneer in a vertical plane independently of the mastic cement.

Anchoring of Panel Walls

Par. 7339. Panel walls of faced masonry shall be securely fastened to the supporting members as required in Paragraph 7138 for solid masonry walls.

SECTION 734

CONSTRUCTION OF FACED MASONRY WALLS

General Requirements for the Construction of Faced Masonry Walls

Par. 7340. The general requirements for the construction of faced masonry walls shall be the same as those for solid walls in Paragraph 7140.

Construction of Faced Solid Masonry Walls

Par. 7341. The brick, solid masonry or stone blocks in all faced masonry walls shall be laid with completely filled mortar joints. Stones shall be laid in their natural bed.

Where a solid wall is faced with hollow units, the joints parallel to the cells of such units shall be completely filled with mortar and the joints at the end and perpendicular to the cells shall be buttered joints. The facing of brick or solid masonry blocks shall be laid at the same time with the backing.

Hollow structural tile or terra cotta units used for facing shall not exceed 3 feet in the horizontal nor 2 feet in the vertical dimension.

The mortar shall be applied before the initial setting commences.

Construction of Faced Hollow Masonry Walls

Par. 7342. The hollow units in a faced masonry wall immediately below the level of decreasing wall thickness shall be filled solid with cement grout or concrete, or shall be covered with a concrete slab at least 2 inches thick.

The joints parallel to the cells of the hollow units in a faced masonry wall shall be completely filled with mortar and the joints at the end and perpendicular to the cells shall be buttered joints.

Where a hollow wall is faced with solid units, such units shall be constructed with full mortar joints.

Brick or solid masonry block facing shall be laid at the same time with the backing.

Hollow structural tile or terra cotta units used for facing shall not exceed 3 feet in the horizontal nor 2 feet in the vertical dimension.

The mortar shall be applied before the initial setting commences.

Construction of Glass Veneer on Masonry Walls

Par. 7343. No single section of the glass veneer shall exceed 10 square feet in area when placed not more than 15 feet above the level of the sidewalk, and not more than 6 square feet when placed over 15 feet above the sidewalk. No single piece of glass shall be more than 48 inches in its greatest dimension and all abutting edges shall be ground square. Miters are prohibited except for wide angles.

Glass veneer shall be placed only against surfaces of true plane, plumb and straight.

Where glass veneer is confined between non-resilient materials at ends, expansion shall be provided for by means of an expansion joint of not less than one-quarter inch at each end and throughout the entire height of the glass.

At terminations of glass veneer installations, exposed edges are to be flashed water tight with approved metal and caulked with waterproof compound.

Where glass veneer extends to the sidewalk surface, it shall rest on cushions of approved resilient material, placed so as to insure at least one-quarter inch clearance above sidewalk. The joint between the bottom edge of the glass section and the top of the sidewalk shall be caulked with a resilient waterproof compound.

In no case shall glass veneer be set so as to extend below the level of the sidewalk. In case sidewalk is set above the bottom of glass veneer after glass veneer is in place, an expansion joint of not less than one-quarter inch shall be provided between the outer face of the glass veneer and the edge of the sidewalk. This expansion joint space shall be filled with a resilient caulking compound from the level of the sidewalk surface to a depth of at least three-quarter inch below said level. For bonding of glass veneer to masonry walls, refer to Paragraph 7336.

Corbels on Faced Masonry Walls

Par. 7344. Corbels built into faced masonry walls for the purpose of supporting structural members shall be of solid units and shall be constructed as required in Paragraph 7143.

Beam Supports in Faced Masonry Walls

Par. 7345. Trusses, beams, joists and other structural members shall be supported on faced masonry walls and their ends protected as required in Paragraph 7144 for solid walls and Paragraph 7245 for hollow walls.

Faced Masonry Parapet Walls

Par. 7346. All parapet walls shall be capped by a tile coping or other coping of solid masonry materials.

Faced Masonry Walls under Construction

Par. 7348. The unsupported height of any faced masonry wall under construction shall be not over 2 stories or 26 feet.

SECTION 735

OPENINGS IN FACED MASONRY WALLS

General Requirements for Openings in Faced Masonry Walls

Par. 7350. Openings, masonry mullions, lintels and arches in faced masonry walls shall conform to all requirements in Section 715 for solid walls and in Section 725 for hollow walls.

SECTION 736

CHASES AND RECESSES IN FACED MASONRY WALLS

General Requirements for Chases and Recesses in Faced Masonry Walls

Par. 7360. Chases for pipes, ducts, conduits, wooden nailing strips, and similar purposes and recesses for stairs, elevators, alcoves and the like shall conform to all requirements of Section 716 for solid walls and Section 726 for hollow walls.

SECTION 737

BONDING FACED MASONRY WALLS TO EXISTING WALLS

General Requirements for Bonding Faced Masonry Walls to Existing Walls

Par. 7370. Faced masonry walls shall be bonded and anchored to existing walls as required in Section 717 for solid walls.

SECTION 739

USE OF EXISTING FACED MASONRY WALLS

General Requirements for the Use of Existing Faced Masonry Walls

Par. 7390. Existing faced masonry walls may be used, increased in height and thickness as permitted in Section 719 for existing solid walls and in Section 729 for existing hollow walls.

CHAPTER 74

NON-MASONRY WALLS

Sec. 740—General Requirements for Non-Masonry Walls.

Sec. 741—Design of Non-Masonry Walls.

Sec. 742—Anchoring Non-Masonry Walls at Intersections.

Sec. 743—Construction of Wood Frame Walls.

Sec. 744—Construction of Solid Wood Walls.

Sec. 745—Construction of Metal Frame Walls.

Sec. 746—Construction of Stucco Walls.

Sec. 747—Construction of Masonry Veneered Walls.

Sec. 748—Combination Walls.

SECTION 740

GENERAL REQUIREMENTS FOR NON-MASONRY WALLS

Scope of Non-Masonry Walls

Par. 7400. Non-masonry walls shall include all exterior and interior walls or partitions constructed entirely or partly of metal, wood, wire mesh, plaster and stucco, or the combination of them. They shall also include non-masonry walls with a masonry veneer.

Materials in Non-Masonry Walls

Par. 7401. All materials used in the construction of non-masonry walls shall be of a quality required in Part VI.

Supports for Non-Masonry Walls

Par. 7402. Wooden beams or girders supporting interior non-masonry bearing walls or exterior non-masonry walls shall be at least 3 inches by 6 inches in size.

Interior non-bearing walls shall be either supported as required for interior bearing walls, or on doubled wooden floor joists, or the equivalent thereof, running parallel to the wall, or on wooden floor joists running crosswise to the wall in which latter case the wall shall be provided with a sole plate.

SECTION 741

DESIGN OF NON-MASONRY WALLS

Stresses in Non-Masonry Walls

Par. 7410. Non-masonry walls shall be so proportioned that the stresses resulting from dead, live, wind, and other loads shall not exceed the allowable stresses permitted in Part VI.

Non-masonry walls forming part of a building shall not be used in contact with earth.

Lateral Support of Wooden Walls

Par. 7411. Wood frame walls shall be supported laterally by floor or roof beams or joists so that the unsupported height of walls shall not exceed 40 times the depth of the studs or posts.

The laterally unsupported height of solid wooden walls shall not exceed 60 times their thickness.

The restraining floor or roof beams or joists shall be anchored to the walls as required in Paragraph 7436.

Lateral Support of Other Non-Masonry Walls

Par. 7412. Walls constructed of steel studding and reinforced plaster or stucco and other non-masonry walls shall be supported laterally so that the unsupported height will not exceed 50 times their thickness.

SECTION 742

ANCHORING OF NON-MASONRY WALL AT INTERSECTIONS

Anchoring Wood Frame Walls to Metal Frame Walls

Par. 7420. Exterior and load bearing wood and metal frame walls shall be anchored to each other at intersections by bolts at least three-eighths of an inch in diameter, spaced not over 3 feet vertically and placed into a post or stud in the wood frame wall, or by a device of equal rigidity.

Anchoring Solid Wood Walls to Framed Walls

Par. 7421. Exterior and load-bearing solid wood walls shall be anchored to framed walls by metal clips and by bolts not less than three-eighths of an inch in diameter, not over 3 feet vertically. The bolts shall be placed into a stud or post of the framed walls.

SECTION 743

CONSTRUCTION OF WOOD FRAME WALLS

Scope of Wood Frame Walls

Par. 7430. Wood frame walls shall include all walls constructed with a rigid wooden framework and covered on one or both faces with a wooden or incombustible sheathing, weatherboarding, shingles and the like. Wood frame walls covered on one face with stucco and with solid sheathing on the other face shall also be included in this Section.

Framing of Exterior Wooden Walls

Par. 7431. The studs or posts of exterior wood frame walls in the first story shall be supported on a sill at least 2 inches thick, having at least a width equal to the depth of the posts or studs. The sill shall be fastened to the foundation wall by bolts at least three-eighths of an inch in diameter, spaced not over 6 feet apart, and embedded at least 7 inches.

The distance between the centers of studs or posts in such walls shall be not more than twelve times their least cross-sectional dimension, except that the spacing of posts in post-and-beam walls with at least one and one-half inch planking is not hereby limited.

The least dimension of any stud or post shall be 2 inches, but their depth shall be at least 4 inches in walls two stories or less in height, and 6 inches in walls over two stories in height, except that 4-inch by 4-inch or larger posts may be used in any wall.

Wood stud or post walls shall have corner posts consisting of at least three 2-inch by 4-inch studs or a post of at least equal cross-sectional area.

Each tier of studs shall be topped by at least two three-quarter inch plates with the joints staggered at least 4 feet, or by a beam of equal thickness. Where separate studs are used in the upper stories they shall be supported on the top plate of the wall below.

Splices of studs or posts in exterior walls shall be designed to develop their full strength.

Posts and studs shall be connected to the plates or sills by mortise and tenon or by any other device which will provide equal rigidity.

All exterior wood frame walls shall be effectively angle braced. Where a wooden sheathing is fastened diagonally to the studs or posts, the bracing may be omitted.

Framing of Interior Wooden Walls

Par. 7432. The studs or posts of an interior wood frame wall shall be supported on a sill at least 2 inches thick if the wall is resting on a foundation wall and the sill shall be anchored to the foundation wall by metal bolts. The studs or posts of other interior walls shall be supported on a bottom plate at least one and one-quarter inches thick, or by a beam at least as wide as the studs, or on the top plate of the wall below.

The distance between the centers of studs or posts in interior non-bearing walls shall not exceed twelve times their least cross-sectional dimension. The depth of such members shall be not less than 3 inches, except that such depth for walls around closets and chimneys shall be at least 2 inches.

Interior bearing walls shall be framed as required for exterior walls in Paragraph 7431.

Each tier of studs in an interior non-bearing wall shall be topped by a plate at least three-quarter inch thick. The studs in an interior bearing wall shall be topped by at least two three-quarter-inch plates or by a beam of equal thickness.

Splices of studs or posts in interior bearing walls shall be designed to develop their full strength.

Posts and studs in interior bearing walls shall be connected by mortise and tenon to the plates or sills, or by any other device of equal rigidity.

Waterproofing of Wood Frame Walls

Par. 7433. All exterior wood frame walls of buildings intended for human occupancy shall be covered with not less than one layer of waterproof building paper weighing at least 30 pounds per 108 square feet. The paper shall be tacked to the outside of the framing or the sheathing, with lapped seams, and it shall be protected on the weather side by weatherboarding, shingles or stucco.

Such waterproof paper may be omitted when sheathing with equivalent water-resisting facing or qualities is used.

Sheathing on Wood Frame Walls

Par. 7434. Wood sheathing or weatherboarding on framed walls shall have an average actual thickness of at least five-eighths of an inch but no part of the sheathing shall be less than three-eighths of an inch thick. Gypsum sheathing used on framed walls shall be at least one-half inch thick. Where sheathing of other materials is used, it shall have a strength at least equal to that of such wooden sheathing.

The horizontal or sloping joints of the sheathing shall be tongued and grooved or lapped at least one-half inch.

The sheathing shall be nailed to every stud or post.

Stucco covering used on one side of wood frame walls shall be as required in Section 746 for stucco walls.

Plywood on walls with the supporting members spaced not over 16 inches on centers shall be five-sixteenths inch thick for sheathing and three-eighths inch thick for exposed panels on exterior walls, and one-quarter inch thick for sheathing on interior walls. Where additional supports are provided, the thickness of the paneling on interior walls may be reduced to three-sixteenths inch.

Shingles on Wood Frame Walls

Par. 7435. Shingles or shakes used on framed walls shall be nailed to a wooden or other sheathing at least three-quarter inch in actual thickness, which sheathing shall be securely fastened to the framing, or to horizontal wooden nailing strips, nailed to the studs, not less than one inch by two inches in size, where gypsum sheathing or plywood is used on the walls.

Beam Supports on Wood Frame Walls

Par. 7436. Floor or roof beams and joists shall be supported on the top plates or on ledger boards at least one by 4 inches in size, cut into and nailed to the studs or posts. The floor joists shall be nailed to the studs.

Openings in Wood Frame Walls

Par. 7438. Openings in wood frame walls shall be framed on the sides by double studs or by a post at least 3 by 4 inches in size, adequately supported at the lower ends.

The top of openings not over 4 feet wide shall be provided with at least two headers not less than 2 by 4 inches in size placed on edge. The header over openings more than 4 feet wide shall be trussed or be of a size sufficient to carry the superimposed loads.

The bottom of all openings shall be provided with a sill at least 2 inches thick and as wide as the studs.

SECTION 744

CONSTRUCTION OF SOLID WOOD WALLS

Scope of Solid Wood Walls

Par. 7440. Solid wood walls shall include all walls constructed entirely of wood without any framework.

Construction of Exterior Solid Wood Walls

Par. 7441. Exterior wooden walls of solid or laminated construction shall be at least 4 inches thick. Where such walls are constructed of solid planks, the joints shall be tongued and grooved.

Wooden walls of a construction having an equal strength and durability, and approved by the Buildings Engineer, may also be used as exterior walls.

Construction of Interior Solid Wood Walls

Par. 7442. Interior bearing wooden walls of solid or laminated construction shall be at least 3 inches thick. If such walls are non-bearing, they shall be at least one and one-half inches thick.

Where interior wooden walls are constructed of solid planks, the joints shall be tongued and grooved.

SECTION 745

CONSTRUCTION OF METAL FRAME WALLS

Scope of Metal Frame Walls

Par. 7450. Metal frame walls shall include all walls constructed with a rigid metal framework and covered on one or both sides with a wooden or incombustible sheathing, weatherboarding shingles, and the like. Metal frame walls covered on one face with stucco and with a solid sheathing on the other shall also be included in this Section.

Framing in Metal Frame Walls

Par. 7451. The posts, braces, girts and other members in exterior metal frame walls shall be of structural or similar shapes, or pressed metal shapes. The thickness of the metal in such shapes shall be not less than No. 24 United States

Standard gauge. The spacing of the studs and the design of the framing shall meet the approval of the Buildings Engineer.

All metal frame walls shall be effectively braced.

Sheathing on Metal Frame Walls

Par. 7453. The metal sheathing on metal frame walls shall be not less than No. 28 U. S. Standard gauge. Sheathing made of metals subject to corrosion shall be protected as required in Paragraph 7454.

Wooden or incombustible sheathing on metal frame walls shall be as required in Paragraph 7434 for wood frame walls.

Stucco covering used on one side of a metal frame wall shall be as required in Section 746 for stucco walls.

Protection of Exterior Metal Frame Walls

Par. 7454. The metal framing and sheathing in exterior walls shall be protected against the corrosive effect of moisture by galvanizing, waterproof sheathing or waterproof covering, or other approved treatment.

SECTION 746

CONSTRUCTION OF STUCCO WALLS

Scope of Stucco Walls

Par. 7460. Stucco walls shall include all walls constructed with a rigid wood or metal framework covered on both sides by lath and stucco, plaster, or gunite.

Framing in Stucco Walls

Par. 7461. The framing in stucco walls shall be as required in Paragraph 7431 for exterior wooden walls, in Paragraph 7432 for interior wooden walls, and in Paragraph 7451 for metal frame walls.

The spacing of studs shall not exceed 24 inches in walls where no sheathing is used under the stucco.

Waterproofing of Stucco Walls

Par. 7462. All exterior stucco walls shall be waterproofed with an asphalt saturated felt or other waterproof building paper weighing not less than 15 pounds per 100 square feet. Such felt or paper shall be tacked to the sheathing or studding with lapped joints.

Sheathing of Stucco Walls

Par. 7463. Where wood or other sheathing is used in stucco walls it shall be as required in Paragraph 7434.

Where sheathing, similar backing or back-plastering is not used, a backing consisting of at least 18 W & M gauge steel wire fastened taut horizontally to the studding and spaced not over 6 inches on centers, or a skeleton wood sheathing consisting of at least 4 inch wide boards spaced not over 4 inches apart shall be installed.

Where the waterproofing is fastened directly to the metal lath provided for the stucco in such a manner that its waterproof qualities will not be affected, the sheathing or backing may be omitted.

Wooden Lath on Stucco Walls

Par. 7464. Wooden lath used as a base for stucco shall be not less than one inch nor more than one and one-half inches wide, and not less than three-eighths of an inch nor more than one-half inch thick.

Wood and other combustible lath shall not extend through walls or partitions from room to room.

Wood and other combustible lath shall be fastened at each stud in a manner that a space of at least one-quarter inch will be maintained between the lath and the sheathing or the studs.

Metal Reinforcement for Stucco Walls

Par. 7465. Metal reinforcement for stucco shall be of such design as will provide full embedment thereof by the stucco and shall be of any of the following types, except in back plastered construction:

a. Expanded type, cut from zinc coated steel sheets or steel sheets coated with rust inhibitive paint after cutting, with openings not less than three-quarter inch in the small dimension, nor more than 3 inches in the large dimension, and not exceeding 4 square inches in area, and weighing not less than 1.8 pounds per square yard.

b. Welded wire fabric or stucco netting coated with zinc or rust inhibitive paint with openings not less than three-quarter inch in the small dimension, nor more than 3 inches in the large dimension, and not exceeding 4 square inches in area, and weighing not less than 20 pounds per 100 square feet.

In back plastered construction, the following types shall be used:

c. An expanded type cut from zinc coated steel sheets, or a wire type steel coated with zinc, with openings not less than three-eights inch in the smallest dimension and weighing not less than 3.4 pounds per square yard.

The types under "c" may also be used in other construction providing stucco mortar is forced through to a thickness of not less than one-quarter inch behind the reinforcement and completely fills the space between backing and reinforcement.

Furring nails and other furring devices shall be of such design as will provide for full embedment of metal by the stucco.

Metal reinforcement of large mesh type shall be securely attached to the supports at not more than 8-inch intervals with approved type furring nails or devices which hold the reinforcement away from the supports at least one-quarter inch. Sheets shall be lapped at least 2 inches at sides and ends.

Metal reinforcement of small mesh type shall be applied as required above except that attachment therefor shall be at not more than 6-inch intervals and laps shall be at least one inch.

In open construction vertical laps shall occur over studs and horizontal laps shall be tied at not to exceed 9-inch intervals. Sheets shall be returned around corners at least 4 inches in sheathed construction and at least one stud in open construction.

Plaster, Stucco and Gunite on Stucco Walls

Par. 7466. All plaster or stucco on stucco walls shall be applied to metal or combustible lath.

The plaster on the inside of exterior walls or on interior walls may be of any composition permitted by this Code.

All outside stucco shall consist of at least three coats: the scratch coat, the brown coat and the finishing coat. The total thickness of the three coats shall be not less than seven-eights of an inch and the thickness of the finishing coat shall be not less than one-eighth of an inch.

The stucco on the weather side of the walls shall consist of one part Portland cement and of not more than three parts sand, to which hydrated lime may be added not to exceed 10 per cent by volume of the cement, except that in the stucco for the finishing coat this addition of lime shall not exceed 33 per cent.

The scratch coat and brown coat shall be kept moist for at least 24 hours after the application.

All gunite used on stucco walls shall be applied to metal lath or be reinforced with wire mesh of a type required in Paragraph 7465.

Gunite shall be applied in not less than two coats and shall be at least one inch in total thickness.

Opening in Stucco Walls

Par. 7468. Opening in wood frame stucco walls shall be constructed as required in Paragraph 7438.

SECTION 747

CONSTRUCTION OF MASONRY VENEERED WALLS

Scope of Masonry Veneered Walls

Par. 7470. Masonry veneered walls shall include all non-masonry walls veneered on the outside with brick, other masonry units, or glass.

Framing of Masonry Veneered Walls

Par. 7471. The framing of masonry veneered walls shall be constructed as required in Paragraph 7431 for exterior wooden walls, in Paragraph 7432 for interior wooden walls, except that no member in such walls shall have any dimension less than 4 inches. The metal framing in such walls shall conform to Paragraph 7451.

Waterproofing Masonry Veneered Walls

Par. 7473. All masonry veneered walls shall be waterproofed on the outside by a building paper or asphalt saturated felt weighing not less than 14 pounds per 108 square feet fastened directly to the sheathing, or approved equivalent.

The vertical or horizontal joints of the waterproofing shall be lapped 2 inches.

Such waterproof paper may be omitted where sheathing with water-resisting facing or qualities is used.

Masonry Veneer on Non-Masonry Walls

Par. 7474. A veneer of solid masonry units used on non-masonry walls shall be at least three and three-quarter inches thick, a veneer of hollow units on such walls shall be at least 6 inches thick, a veneer of flat random stone units on such wall shall be not less than 8 inches thick and a veneer of rubble stone units on such walls shall be not less than 12 inches thick.

The height of masonry veneer shall not exceed one story nor 15 feet above the ground level, except that where the entire wall is constructed of incombustible materials, such height may be increased to not more than 2 stories or 25 feet.

The masonry veneer shall be anchored to the walls by 30 penny galvanized nails or by anchors or clips of metal protected against corrosion, spaced not over 12 inches on centers vertically nor over 36 inches horizontally. The nails shall be driven at least to a 2 inch penetration and all clips, anchors and nails shall have at least a 2 inch bury in the veneer.

Non-Masonry Walls with Glass Veneer

Par. 7475. Non-masonry walls used as a backing for glass veneer shall have a rigid frame with not less than 3 inch by 4 inch wooden studs not over 8 feet high spaced not over 12 inches on centers, supported on incombustible structural members or masonry, and covered on both sides with at least one inch plaster on metal lath.

Non-masonry walls of equal rigidity or stability may also be used as backing for glass veneer.

Wood frame wall backing shall not be used less than 3 feet from the ground.

The glass veneer shall be fastened to the non-masonry walls as required in Paragraph 7336 for glass veneer on masonry walls, and shall be constructed as required in Paragraph 7343.

Beam Supports on Masonry Veneered Walls

Par. 7476. Floor and roof beams or joists shall not be supported on the masonry or glass veneer of non-masonry walls.

Beams and joists shall be supported on wood-frame walls as required in Paragraph 7436.

Support of Masonry

Par. 7477. The masonry on non-masonry walls shall be supported at the bottom in the first story on masonry or reinforced concrete foundation or basement walls.

Openings in Masonry Veneered Walls

Par. 7478. The masonry or glass veneer shall be supported over the openings in the wall by lintels or arches of incombustible materials.

The openings in a wood-frame wall veneered with masonry or glass shall be framed as required in Paragraph 7438.

Firestopping Masonry Veneered Walls

Par. 7479. Masonry veneered walls shall be firestopped as required for wood or metal frame walls in Part V.

SECTION 748

COMBINATION WALLS

Half-Timbered Walls

Par. 7481. The framework of half-timbered walls shall be rigidly constructed of not less than 6 by 6 inch timbers securely connected by mortise and tenon or by similar rigid connections.

The space between the timbers shall be filled by solid or hollow masonry, securely anchored to the framework and shall be finished flush on the weatherside with the timber framework. In no case shall the masonry be less than 6 inches thick, exclusive of plaster.

The masonry filling shall not be relied on in carrying floor or roof loads.

Half-timbered walls surrounding buildings for human occupancy shall be effectively waterproofed.

Half-timbered walls shall not be used where masonry walls are required.

CHAPTER 75

FLOOR AND ROOF CONSTRUCTION

Sec. 750—General Requirements for Floors and Roofs.
Sec. 753—Flat and Segmental Arch Floor Construction.
Sec. 755—Wood Floor and Roof Construction.
Sec. 756—Composite Floor and Roof Construction.
Sec. 757—Ceiling Construction.
Sec. 758—Protection of Openings and Open Sides of Floors and Roofs.
Sec. 759—Construction of Roofing.

SECTION 750

GENERAL REQUIREMENTS FOR FLOORS AND ROOFS

Scope of Floor and Roof Construction

Par. 7500. This Chapter includes the requirements for details of construction for flat and segmental arch floors, wood floors and roofs, ceilings and roofing.

For metal deck, gypsum and reinforced concrete floors and roofs, refer to Part VI.

Drainage of Basement Floors

Par. 7503. The lowest floor in basements and cellars shall be so surfaced and sloped towards one or more floor drains or sumps, that water and other liquids shall flow easily from every point of the floor into the drains or sumps.

Snow Guards on Roofs

Par. 7504. All roofs having a slope of 25 degrees or more shall be provided with approved snow guards so arranged as to prevent the snow from falling on any street, alley or other public way.

Restrictions for Sloping Roofs

Par. 7505. The eaves of no roof having a slope of 30 degrees or more shall be closer to a street, adjoining property line or public way than one-fourth the height of such eaves above the ground or pavement at any point within such limits, unless protected by a parapet wall not less than two feet high above such eaves or other equivalent protection approved by the Buildings Engineer.

Gutters and Downspouts

Par. 7506. The gutters of adjacent buildings shall not be connected with common leaders, but each building shall have its individual leaders or downspouts on its own property. Leaders or downspouts from buildings over 4 stories or 50 feet in height shall be inside of the exterior walls of the building.

SECTION 753

FLAT AND SEGMENTAL ARCH FLOOR CONSTRUCTION

Scope of Construction Details for Flat and Segmental Arch Floors

Par. 7530. This Section includes the requirements for details of construction of all floor systems consisting of segmental or flat arches constructed of solid or hollow masonry supported on structural members.

Structural Framing for Arched Floors

Par. 7531. The supporting members for arched floors shall be of rolled structural shapes, built up structural sections, or reinforced concrete.

The spacing of beams supporting flat arches shall not exceed 8 feet and the spacing of beams supporting segmental arches shall not exceed 12 feet.

The tie rods shall be not less than three-quarter inch in diameter nor shall they be spaced over 15 times the width of the beam flanges.

The tie rods shall be placed in the line of thrust which shall be taken as not less than 3 inches above the bottom of the beam nor less than 2 inches above the bottom of the floor tile.

Construction of Solid Floor Arches

Par. 7532. The units in a segmental arch shall be laid up on rigid centering.

The joints at right angles to the long side of the solid units shall be staggered.

All joints in a solid floor arch shall be solidly filled with Portland cement mortar.

Construction of Hollow Floor Arches

Par. 7533. The units of a hollow segmental arch shall be laid up on rigid centering.

All hollow arches shall be set on skewbacks that are moulded to fit the supporting beam sections and so designed as to trasmit the thrust of the arch to the beams at a point above the supporting flange. All arches shall be properly keyed.

All joints parallel to the cells shall be solidly filled with Portland cement mortar and all other joints shall be buttered with the same mortar.

Minimum Thickness of Floor Arches

Par. 7534. Solid brick segmental floor arches shall have a minimum thickness of three and three-quarter inches for spans of 5 feet or less and a minimum thickness of 8 inches for spans over 5 feet.

Flat floor arches constructed of hollow masonry units shall have a depth of not less than one and one-half inches for every foot of span, and for fractions thereof, the depth shall be increased in proportion, but in no case shall this depth be less than 6 inches. The depth shall not include that portion of the units which extends under the supporting beams.

Segmental hollow block floor arches shall be at least 6 inches thick.

Rise of Floor Arches

Par. 7535. The effective rise of segmental or flat floor arches constructed of solid or hollow masonry units shall be at least one inch for every foot of span, and for fractions thereof the rise shall be increased in proportion.

In segmental arches the effective rise shall be assumed as the vertical distance between the highest point of the intrados and the spring line of chord. The effective rise of a flat arch of clay tile shall be taken as one-half inch less than the depth from the top of the clay tile to the center of the rod.

Anchoring Arched Floors to Walls

Par. 7536. The beams supporting arched floors shall have at least a four-inch bearing on masonry walls and shall be anchored to the supporting walls by standard or other metal anchors.

Masonry walls shall not support floor arches unless such walls are designed to resist the thrust from the arches.

Openings in Arched Floors

Par. 7537. The sides of an opening parallel or nearly parallel to the springing line of floor arches shall be suitably supported by beams.

In case of circular, elliptical and similar openings the sides of the circumscribing rectangle shall be considered the side of the opening.

SECTION 755

WOOD FLOOR AND ROOF CONSTRUCTION

Scope of Construction Details for Wooden Floors and Roofs

Par. 7550. This Section includes the requirements for construction details of floors and roofs constructed entirely of wood and of wood planking on structural metal or reinforced concrete framing.

Framing for Wood Floors and Roofs

Par. 7551. Floor and roof joists or beams supported on top of wooden or metal girders shall have an end bearing of at least 3 inches.

Where floor and roof joists or beams frame into wooden girders the ends shall be supported on metal joist hangers, except that where the load is not over 50 pounds per square foot, they may be supported on hardwood ledger strips at least 3 inches by 3 inches in size securely nailed to the girder.

The ends of at least every fourth joist resting on, or framing into metal or wood girders shall be tied to the ends of the opposite joist by metal straps near the tops, or the ends shall be fastened to the girders by nails or metal clips. Where the ends of the joists overlap they may be nailed to each other instead of the required anchoring.

Headers framing into joists shall be supported by ledger strips at least 2 inches by 3 inches in size or by metal joist hangers.

Wooden joists and beams supported on masonry or non-masonry walls shall have at least four-inch end bearings.

Bridging of Floor Joists

Par. 7552. Wooden or metal cross bridging shall be placed between and fastened firmly to wooden joists having a span over 8 feet. The distance between the lines of bridging and between the supports and the bridging shall be not more than 8 feet.

Bridging shall also be placed between the ends of joists supported on top of girders or on framed walls, where the joists are not nailed to the studs.

Each member of the wood cross bridging shall be at least 1 inch by 3 inches in size. Where metal bridging is used, it shall be of equal strength and rigidity.

Steel joists supporting wooden floor planking shall be provided with bridging as required in Paragraph 6378.

Flooring on Wood Floors and Roofs

Par. 7554. The subflooring on floors shall be tongued and grooved and not less than one inch thick, except that where plywood supported on joists spaced not over 16 inches on centers is used as subflooring, it shall be not less than five-eighths inch in actual thickness.

Plywood sheathing used on roofs shall be at least one-half inch thick. Shingles shall not be nailed directly to plywood sheathing, but to nailing strips, not less than one inch by two inches in size, fastened to the joists or rafters through the plywood.

Where floors or roofs are constructed of timber set closely on edge, the members shall be nailed together at intervals not exceeding 18 inches. Where such floors extend over more than one span at least two-thirds of the members in each span shall pass over the supports. Members shall not be spliced more than once in a distance equal to a span, and all splices shall be staggered at least one-quarter of the span length.

Anchoring Wood Floors and Roofs to Walls

Par. 7555. The end of joists, beams or girders of wood floors and roofs projecting into masonry walls shall be beveled at least 3 inches in 12 inches so that the bottom of the projection will be longer than the top.

The ends of beams or joists of wood floors and roofs shall be anchored or otherwise fastened to the supporting walls. Where masonry walls form the support, the anchors shall be of structural metal at least one inch by three-eighths inch in size, embedded at least four inches in the masonry and spaced not over five feet six inches. Such anchors shall be fastened near the bottom of the beam or joist and placed on both ends of the joist. Where non-masonry walls form the support, each beam or joist shall be bolted or nailed to the frame of the wall.

Openings in Wood Floors and Roofs

Par. 7556. The edge of wood floor and roof planking around openings in excess of one square foot shall be supported on structural members.

In wood floors of heavy laminated construction, the free ends of the flooring timber shall be supported at the edge of openings more than one square foot in area.

Firestopping of Wood Floors and Roofs

Par. 7557. All wood floors and roofs which are provided with ceilings shall be firestopped over girders and walls which support the floor beams or joists on their tops.

The fire stopping shall extend from the ceiling to the floor planking for the full width or length of the floor and shall be constructed as required in Paragraph 5916.

Ventilation under Wood Floors

Par. 7558. A clearance of at least 18 inches shall be maintained between the underside of wood joists, beams or girders and the top of the ground directly underneath, except as otherwise herein permitted.

Effective cross-ventilation shall be provided in the space under the floor immediately above the ground, regardless of whether such space is excavated or not. One ventilating opening of 1 square foot in area shall be provided in every 25 linear feet or major fraction thereof of the sub-structure walls enclosing or subdividing the space under such floor. All such exterior openings shall be provided with a metal screen as required in Paragraph 7601.

These requirements for the minimum space under wood joists and beams and the ventilation of such space may be waived if all wooden parts of the floor are preservatively treated as required in Section 627, and if in rooms used or intended to be used for human habitation, an effective damp-proofing membrane, at least equal to a 40-pound roll roofing laid in asphalt, is placed between the sub-floor and finish-floor, in which case the finish-floor need not be preservatively treated.

SECTION 756

COMPOSITE FLOOR AND ROOF CONSTRUCTION

Scope of Composite Floor and Roof Construction

Par. 7560. Composite floors and roofs shall include all floors and roofs where the members consist of two or more structural materials, except reinforced concrete.

Design and Construction of Composite Floors and Roofs

Par. 7561. Composite floors and roofs shall be designed and constructed in accordance with the requirements of Chapter 68.

SECTION 757

CEILING CONSTRUCTION

Scope of Ceiling Construction

Par. 7570. All ceilings fastened directly to the underside of floor and roof joists or beams and all ceilings having an independent framing, or a suspended framing, shall be constructed in conformity with this Section.

Wood Framing for Ceilings

Par. 7571. Wood joists for self-supporting or suspended ceiling shall be at least 2 inches by 4 inches in size, spaced not over 16 inches on centers.

Where wood hangers are used for ceilings suspended from the floor or roof beams or joists, such hangers shall be at least one inch by four inches in size, spaced not over 6 feet on centers in either direction.

Metal Framing for Suspended Ceilings

Par. 7572. The metal framing of a suspended ceiling consisting of main runners and cross furring shall be as given in this paragraph.

The main runners shall be not less in size than those shown in the following table:

TABLE 7572T1

Distance between hangers in feet	Size of Main Runners
Not more than 3..............	1½ inch channel, cold rolled
Not more than 4..............	1½ x 1½ x ⅛ inch angle 1½ inch channel, at least 1.12 pounds per foot, hot rolled
Not more than 5..............	2 inch channel, hot rolled or 1½ x 1½ x 3/16 inch angle

The spacing of the cross furring shall be not greater than that shown in the following table, but such spacing shall also conform to the requirements in Paragraph 7574:

TABLE 7572T2

Distance between main runners in feet	Size of Cross Furring					Remarks
	¼ inch round	⅜ inch round	¾ inch channel	1 inch channel	1 inch channel hot rolled	
Not more than 2...	12 inches	19 inches	19 inches	..	..	Pressed Channels
Not more than 2½.	..	12 inches	12 inches	..	..	
Not more than 3...	..	..	23½ inches	..	..	
Not more than 3½.	..	..	19 inches	..	..	
Not more than 4...	..	..	16 inches	23½ inches	..	Hot or cold rolled Channels unless noted
Not more than 4½.	..	..	..	19 inches	..	
Not more than 5...	..	..	..	..	12 inches	

The cross furring shall be securely attached to the main runners by special clips or by not less than 2 strands of 16 W&M gauge galvanized wire or approved equal.

Any framing for suspended ceiling not in accordance with the requirements of this Paragraph shall also be permitted, if it is capable of sustaining a live load of 15 pounds per square foot, without any deflection, settlement or distortion which will affect the strength or safety thereof.

All steel or iron shapes shall be galvanized or have a shop coat of paint.

Hangers for Metal Lath Ceilings

Par. 7573. Where the metal lath ceiling is attached directly to the undersides of joists or beams, the hangers shall be of not less than 10 W & M gauge galvanized wire when supporting not more than 12 square feet and of not less than 8 W & M gauge galvanized wire when supporting not more than 16 square feet of ceiling attached to concrete beams, and of not less than 2 strands of 14 W & M gauge galvanized wire if attached to bar joists. Such ceilings shall be attached to steel beams by special clips.

Hangers supporting the main runners shall be at least of the following sizes:

TABLE 7573T

Area of ceiling supported, in square feet	Kind of Hanger		
	Mild steel rounds	Galvanized wire	Flats
Not more than 12............	3/16 inch diameter	6 W&M gauge	....
Not more than 16............	7/32 inch diameter	5 W&M gauge	....
Not more than 25............	....	....	1x3/16 inch

Where the hangers are attached to concrete construction, they shall be secured to the reinforcement or, where attached to other than cinder concrete, they may be looped and embedded 2 inches in the concrete. Approved inserts or other devices may also be used for attaching the hangers. The hangers shall be securely attached to other construction subject to the approval of the Buildings Engineer.

Metal Lath for Suspended Ceilings

Par. 7574. The metal lath used in suspended ceilings shall be as shown in the following table:

TABLE 7574T

Type of Lath	Weight, pounds per square yard	Spacing of Horizontal Supports in Inches	
		Metal	Wood
Flat Expanded Lath	3.0	12	13½
	3.4	13½	16
Flat Rib Lath	2.75	12	16
	3.0	16	19½
	3.4	19½	19½
	4.0	19½	19½
⅜-inch Rib Lath or lath of equal rigidity	3.0	24	24
	3.4	24	24
	4.0	24	24
Sheet Lath	4.5	19½	24

Where the metal lath is attached to wood supports, it shall be secured with not less than 6d common nails or with other nails, staples or means which afford equal carrying strength.

Where metal lath is attached to metal supports, it shall be secured with not less than 18 W & M gauge galvanized, soft annealed wire spaced not over 6 inches apart along such members.

The side laps of metal lath shall be secured to supports and tied between supports at intervals not exceeding 9 inches.

Wooden Lath for Ceilings

Par. 7575. Wooden lathing used as a base for plastered ceilings shall be made of lath not less than one inch by three-eighths of an inch nor more than one and one-half by one-half inch.

Such lath shall be fastened to each supporting joist with not less than three-penny fine nails and there shall be a clear space of at least one-quarter inch but not more than three-eighths inch between each lath.

Wooden lath shall not be carried through walls or fixed partitions.

Gypsum and Insulating Lath for Ceilings

Par. 7576. Gypsum lath used on ceilings as a base for plaster shall be not less than three-eighths inch thick, and shall be fastened with nails having a size of not less than 13 gauge, one and one-eighth inch long, with a three-eighths inch diameter head, spaced not more than 4 inches on centers along the center line of each joist or beam.

Insulating lath shall be fastened with nails spaced not over four and one-half inches on centers along the center line of each joist or beam. Such nails shall be four-penny box nails or larger for the one-half inch lath and six-penny box nails or larger for the one-inch lath.

Any other method of fastening gypsum or insulating lath having an equal carrying strength and approved by the Buildings Engineer, shall also be permitted.

Materials for Plaster on Ceilings

Par. 7577. The materials used in the plaster for ceilings, except sand, shall conform to the requirements for the materials in masonry mortars in Section 619, and also to the requirements herein.

Keene's cement shall have a tensile strength of not less than 450 pounds per square inch, after a setting period of 7 days, and shall conform to the "Standard Specifications for Keene's Cement", of the American Society for Testing Materials, Serial Designation C61-30.

Sand shall be clean, sharp, coarse and siliceous, free from salt, lime, clay, organic material, and other foreign matter.

Hair binder shall be water-soaked, well beaten, clean, long winter hair.

All other materials used in the plaster for ceilings shall meet with the approval of the Buildings Engineer.

Proportioning Plaster for Ceilings

Par. 7578. Lime plaster for the first or scratch coat, or where only one coat of plaster is used on ceilings, shall consist of one part of lime and not more than two and one-half parts of sand by volume. The brown or second coat, where used, shall consist of one part of lime and not more than three parts of sand by volume. Each cubic yard of such plaster shall contain not less than four pounds of hair or fiber binder well distributed throughout the mixture. Where lime is used in the third or finish coat, the plaster shall consist of one part of gypsum or plaster of Paris and not more than one part of lime putty by volume.

Gypsum plaster, where only one coat of plaster is used on ceilings, shall consist of one part of gypsum and not more than two parts of sand by weight. Where two coats of plaster are used, the first or brown coat shall be as required above for a single coat of plaster. The second or finish coat shall be either of the same mixture as required for the first coat or shall consist of one part of gypsum and not more than two parts of lime putty by weight. Where three coats of plaster are used, the first or scratch coat shall be as required above for a single coat of plaster. The second or brown coat shall consist of one part of gypsum and not more than three parts of sand by weight. The third or finish coat shall be as required above for the second coat of a two coat plaster.

Cement plaster for ceilings shall consist of one part of cement and not more than three parts of sand by volume, to which may be added slaked or hydrated lime or an approved brand of diatomaceous silica in an amount not to exceed 15 per cent of the cement by volume.

Keene's cement shall be proportioned according to the manufacturer's recommendations.

Any plaster found to contain sand in a higher proportion than permitted herein shall be condemned and removed from the premises.

Additional requirements for plaster on fire-resistive construction are included in Chapter 59.

Applying Plaster to Ceilings

Par. 7579. The total thickness of plaster on ceilings including the lath, where such is used, shall be not more than one and one-half inches. This rule does not apply to plaster ornaments anchored directly to the lath or the underside of floors or roofs.

The thickness in inches of such plaster shall be not less than that shown in the following table:

TABLE 7579T

Kind of Plaster	One Coat	More than One Coat					Remarks	
		1st	2nd	Finish	1st plus 2nd	Three Coats Total		
Lime	½	..	..	..	¾	..	On a flat surface or metal lath	Thickness includes lath, where such is used
	⅝	..	..	..	¾	..	On wood or gypsum lath	
Gypsum	⅜	¼	..	..	⅜	..	Thickness does not include lath, where such is used	
Cement ..	⅜	⅜	⅜	⅛	¾	⅞		

Plaster shall not be applied directly to the underside of concrete floors or roofs unless a mechanical key or bond is provided.

Plaster applied to lath shall be well forced through all openings in the lath.

Where more than one coat is applied, the first coat shall be well scored to provide a key for the second coat.

Lime or gypsum plaster shall be thoroughly set and dry before the next coat is applied.

Lime plaster shall not be applied to gypsum lath.

Cement plaster shall not be applied to gypsum insulating or wood lath, unless first covered by metal reinforcing, nor shall it be applied to a lime plaster or any gypsum base or a bituminous base.

Gunite shall be applied to ceilings as required for gunite on walls in Paragraph 7466.

Additional requirements for plaster on fire-resistive construction are included in Chapter 59.

SECTION 758

PROTECTION OF OPENINGS AND OPEN SIDES OF FLOORS AND ROOFS

Scope of Openings to be Protected

Par. 7580. Openings in floors and roofs for ladderways, hatchways, chutes and other openings, except those for power transmission, with a lesser dimension exceeding 6 inches and with a greater dimension exceeding 18 inches shall be protected by guards or railings on all sides.

Such guards or railings shall be of the fixed type on all sides of the opening except at the entrance side, where they may be removable.

Openings provided with hinged covers need not be protected with railings or guards but shall be guarded with chains or ropes while uncovered.

For guard around power transmissions, refer to Chapter 92.

Scope of Open Sides to be Protected

Par. 7581. Open sides of floors, platforms and runways shall be protected by fixed guards or railings, except where such sides are less than 5 feet from the ground or from another floor or platform immediately below, extending at least 5 feet beyond the open side.

No guards or railings are required at the exits to stairs, ramps or fixed ladders.

Construction Details of Pipe Railings

Par. 7582. Pipe railings, used where guards or railings are required in this Section, shall be as follows:

They shall consist of posts spaced not over 6 feet on centers, of a top rail placed not more than 48 inches nor less than 42 inches from the floor level, of an intermediate rail placed approximately halfway between the top rail and the level of the floor and of a toe board at the edge of the floor.

Pipe rails which are accessible to children shall be so constructed that they will not pass a 10-inch diameter ball.

The posts and top rail shall be of metal pipes having at least one and one-quarter inches inside diameter and the intermediate rail shall be of at least one inch inside diameter pipe.

The toe board shall be solid and extend at least two and one-half inches above the floor level. No toe boards are required in connection with removable railings.

The railing shall be so anchored to the floor as to safely withstand the lateral force specified in Paragraph 6057.

Construction Details of Metal Guards

Par. 7583. Metal guards, used where guards or railings are required in this Section, shall be as follows:

They shall have posts spaced not over 6 feet on centers and a top rail placed not less than 42 inches from the floor level. Intermediate rails shall be placed not over 22 inches on centers or the portion between top rail and floor level shall be so constructed as to afford an equal protection.

Metal guards which are accessible to children shall be so constructed that they will not pass a 10-inch diameter ball.

All fixed metal guards shall have toe guards projecting at least two and one-half inches above the floor level.

Metal guards shall be so anchored to the floor as to safely withstand the lateral force specified in Paragraph 6057.

Construction Details of Wooden Railings

Par. 7584. Wooden railings, used where guards or railings are required in this Section, shall be as follows:

They shall have posts spaced not over 6 feet on centers and a top rail placed at least 42 inches from the floor level. Intermediate rails shall be placed not over 22 inches on centers or the portion between top rail and floor level shall be so constructed as to afford an equal protection.

Wooden railings accessible to children shall be so constructed that they will not pass a 10-inch diameter ball.

The top rail shall be at least 2 by 4 inches or shall consist of two pieces at least one by four inches at right angles. The posts shall be at least 2 by 4 inches, and the intermediate rails at least 2 by 2 inches or 1 by 4 inches.

All fixed wooden railings shall have toe guards projecting at least two and one-half inches above the floor level.

Wooden railings shall be so anchored to the floor as to safely withstand the lateral force specified in Paragraph 6057.

SECTION 759

CONSTRUCTION OF ROOFING

Construction of Roofing

Par. 7591. Built-up composition and sheet metal roofings shall be constructed as required in Paragraph 5974.

Wooden shingle roofing shall be constructed as required in Paragraph 5975.

Flashing on Roofs

Par. 7595. All flashing and counter-flashing used on roofs around chimneys, at valleys, ridges, intersections with walls and at other places shall be of non-corroding metals or metals protected against corrosion.

Repair or Replacement of Existing Non-Conforming Roofing

Par. 7596. In the event that any surface of any existing wood shingled roof, ordinary roof, or any other roof which does not comply with the provisions of this Code is repaired or replaced to an extent which exceeds 25 per cent of the area of any such surface, the entire surface repaired or replaced shall be made to conform to the requirements of this Code for roofs on new buildings.

Provided, however, that all existing wood shingled roofs, ordinary roofs, and all other roofs which do not comply with the provisions of this Code, shall be made to conform to the requirements of this Code within ten years after the passage of this Code.

CHAPTER 76

DOOR AND WINDOW CONSTRUCTION

Sec. 760—General Requirements for Doors and Windows.
Sec. 761—Requirements for Doors.
Sec. 762—Fire Door Installation.
Sec. 764—Revolving Door Construction.
Sec. 765—Window Construction.
Sec. 766—Skylights.
Sec. 767—Floor and Sidewalk Lights.
Sec. 768—Louvers.
Sec. 769—Scuttles.

SECTION 760

GENERAL REQUIREMENTS FOR DOORS AND WINDOWS

References for Doors and Windows

Par. 7600. For restrictions on doors, windows and similar devices opening on streets, sidewalks or driveways, refer to Paragraph 2137.

Protection of Openings near the Ground

Par. 7601. Where any part of an exterior door opening, except that leading into the first story or of a window or other exterior opening on a building, is within 2 feet of the ground level, such opening shall be protected by one or more of the following:

a. By a fixed window;

b. By a fixed or detachable grating or screen, made of not less than No. 12 United States Standard Gauge wire protected against corrosion, with no hole large enough to pass a one-half inch diameter ball;

c. By a fixed or detachable plate of not less than No. 16 United States Standard Gauge metal protected against corrosion;

d. In case of a door opening, by a self-closing door or self-closing screen constructed as required in "b".

Where the space between the lowest floor of a building and the ground level is open, such space shall be entirely enclosed by a screen constructed as required under "b", resting on a masonry wall not less than 6 inches thick and extending to a depth of at least 2 feet below the ground level, except that such enclosure may be omitted in the following cases:

a. Where such space is 200 square feet or more in horizontal area, at least 4 feet high and open on at least 3 sides;

b. Where such space is less than 200 square feet in horizontal area, more than 18 inches high, and open on at least 3 sides.

SECTION 761

REQUIREMENTS FOR DOORS

Exit Door Installation

Par. 7611. Doors in required exits shall be hinged doors swinging in the direction of exit travel, except that doors in exits leading from classrooms, from apartments or rooms therein, from dwellings not over 2000 square feet in area or 3 stories or 35 feet in height, from storage buildings, from storage rooms, from shipping and receiving rooms in commercial and industrial buildings not over 1500 square feet in area, and from garages and doors in elevator shaftway enclosures may swing in the opposite direction or may be sliding doors.

Doors in required exits shall be so hung and arranged that they will not obstruct the travel along an exit passageway, stairway or other required means of egress. A door swung flat against a wall is not considered an obstruction.

Any door opening from cloak or similar rooms into a required exit passageway shall be hung so that it will close in the direction of exit travel in the passageway.

Exit Door Hardware

Par. 7612. Hardware on doors in exits shall be such that the doors may be readily opened from the inside without the use of keys during the time when the building is occupied, except that the use of draw-bolts in places of Private or Public Assembly is forbidden. This requirement shall not apply to the doors of rooms where persons are under legal restraint.

Exterior doors which are usually kept closed in required exits of Public Assembly buildings, in Private Assembly buildings, except schools, and in the first stories and sales basements of Commercial buildings, shall be provided with latches of the self-releasing type, such as panic bolts or similar devices of non-corrodible metal, which will permit the door to open when pressed against.

Doors Opening on Stariways

Par. 7613. No door shall open immediately on a flight of stairs, but a landing, the length and width of which is not less than the width of such door plus one foot, shall be provided between such door and such stairs. No riser shall be located within one foot of any exit door.

This regulation shall not be interpreted to apply to any private residence or to any other dwelling less than 3000 cubic feet in volume.

Floor Level at Doorways

Par. 7614. The floor on both sides of a doorway shall be at the same level for a width of at least 3 feet, except that there may be a single step up not over 8 inches high at the door, in the direction of the swing of the door, provided that the landing at the bottom of the step is at least 3 feet wide.

Thresholds in doorways shall not be over one inch high.

Doorway Guards

Par. 7615. Doorways with sills more than 5 feet above the ground level or a floor immeediately below, or above a platform extending at least 5 feet beyond the plane of the door, shall be guarded by rails or rolling barriers while they are not in use and the doors are kept open. Where single guard rails are used, they shall be not less than 3 feet nor more than 4 feet above the sill. Rolling barriers shall be at least 3 feet high.

SECTION 762

FIRE DOOR INSTALLATION

General Requirements for Fire Door Installation

Par. 7620. The installation of fire doors shall be in accordance with the general requirements in Section 761 in so far as they apply and with the special requirements of this Section.

All fire doors shall be self-closing, except those in elevator shaftway enclosures, and except such doors which are permitted by the Buildings Engineer to be kept open, which shall be arranged to close automatically with the fusing of an approved fusible link or the operation of an approved quick operating closing device properely protected against injury where necessary.

Fitting of Fire Doors

Par. 7621. Fire doors, when closed, shall completely cover the doorways in the walls and partitions or the openings in the floors or roofs to which they are fitted, so as to prove an effective stop for fire and smoke. A swinging fire door shall either overlap both jambs and the head of the opening not less than four inches or be fitted to a fire-resistive frame with a rabbet the full thickness of the door and with not less than one-half inch overlap on the door. A sliding fire door, except in enclosures about passenger elevators, shall overlap each jamb and the head of the opening not less than four inches. A sliding door in an enclosure about a passenger elevator shall overlap jambs, head and adjoining panels not less than one-half inch. Fire doors shall fit at the floor with clearance of not over one-quarter inch.

Thresholds for Fire Doors

Par. 7622. In buildings with combustible floors, doorways required to have fire doors shall have incombustible thresholds the full thickness of the wall, extending at least four inches from the face of the wall where a door is hung and extending laterally at least six inches beyond each jamb of the doorway. Thresholds may be flush with the floor.

Space around Fire Doors

Par. 7627. Space around fire doors necessary for their operation shall at all times be kept unobstructed and when deemed necessary by the Buildings Engineer, a screen or railing protection shall be installed to insure no storing or placing of material which would prevent the operation of the fire door.

SECTION 764

REVOLVING DOOR CONSTRUCTION

Classification of Revolving Doors

Par. 7640. Revolving doors shall be of one of the following types:

(a) Type A revolving doors are those in which the individual wings are maintained in the normal revolving position and are so designed and constructed that each wing is independently supported and provided with a safety release incorporated in said support so designed that simultaneous outward forces exerted by persons of ordinary strength on both sides of the door pivot will cause the wings instantly to fold back on themselves, like the leaves of a book in the direction of exit travel.

(b) Type B revolving doors are those in which the individual wings are maintained in the normal revolving position by braces, or similar devices, are so designed and constructed that the braces which hold the wings in their normal position support two or more interconnecting wings and may be released by simple mechanical means, thereby permitting the individual wings to be collapsed.

Construction of Revolving Doors

Par. 7641. At least one push bar shall be provided on each wing of a revolving door, unless there are no glass panels within 3 feet from the floor.

Glazing of Revolving Doors

Par. 7642. Glass installed in the wings or the enclosures of revolving doors shall be at least one-quarter inch thick plate glass.

Speed Regulation of Revolving Doors

Par. 7643. Every revolving door serving in an exit shall be so constructed and maintained that the rate of its revolving speed during actual use can, at no time, exceed 15 revolutions per minute. Any means for so regulating such speed and the failure of such regulatory means shall not interfere with the normal operation and use of such doors.

SECTION 765

WINDOW CONSTRUCTION

Spacing of Windows

Par. 7650. Window openings shall not extend over more than one story. The window sash may be continuous from story to story if the space between the edge of the floor and the sash is effectively sealed with incombustible materials.

Design of Windows

Par. 7651. Window frames, sashes, mullions and any other parts of a window shall not be used to transmit or support loads, except wind loads.

All parts of exterior windows shall be so designed and proportioned that the stresses resulting from wind loads shall not exceed those permitted in Part VI.

Weatherproofing Windows

Par. 7652. The window frames of buildings shall be firmly fastened to the walls thereof and the space between the frame and the wall shall be caulked with a waterproof cement.

Metal window frames shall be so fastened to the walls that the expansion caused by temperature changes shall not displace the windows.

All windows shall be constructed reasonably weathertight.

Glazing of Windows

Par. 7653. The glass panes in windows shall be fastened to the sash by glazing clips, continuous glazing angles or similar devices.

No glass pane shall exceed 24 square feet in area, except in show windows, where no single pane shall be more than 100 square feet in the first story and 50 square feet above the first story.

Hardware on Windows

Par. 7654. On windows the hinges, sliding bolts, locking devices and all those parts of the hardware which are moving or which are in contact with moving parts shall be non-corroding metals, or metals protected against corrosion.

Hanging Windows

Par. 7655. The sash cords or chains or other similar devices in hung windows shall be of a sufficient strength to support four times the weight of the window.

Sash chains shall be of non-corroding metals, or metals protected against corrosion.

Window Fire Shutters

Par. 7656. Where exterior windows are protected by fire shutters, at least one shutter in every 40 feet in each story shall be so constructed that it may be opened readily from the outside and shall be distinctly marked from the outside.

Window Guards

Par. 7657. Exterior windows with sills less than 2 feet above the finished floor and more than 10 feet above the ground shall be provided with guards to prevent a person from falling out. Such guards shall extend at least to a height of 3 feet from the floor and shall be so constructed as to permit emergency entrance in case of fire.

Windows in the exterior walls of shafts shall be protected by vertical metal bars at least five-eighths inch in diameter and spaced not over 10 inches apart, unless the sill of the window is less than 5 feet from a floor landing or the lowest tread below.

Window openings less than 2 feet from the ground level, in the exterior walls of buildings, shall be protected as required in Paragraph 7601.

Windows of Glass Blocks

Par. 7658. Ordinary windows of glass blocks shall be constructed as required for glass block panels in Paragraph 7249. Fire-resistive windows of glass blocks shall be as required in Paragraph 5967.

Window Cleaners' Anchors

Par. 7659. Exterior windows shall be provided with approved window cleaners' anchors of corrosion-resistive metals, except as permitted below, if the sills of such windows are 12 feet or more from the ground level, an adjacent flat roof, or a balcony, or similar structures, projecting not less than 5 feet from the wall. Windows within 12 feet of projections less than 5 feet wide shall be provided with anchors if required by the Buildings Engineer.

Double hung windows less than 6 feet in the vertical dimension or other windows which can be cleaned from the inside, are not required to have window claners' anchors.

SECTION 766

SKYLIGHTS

Design of Skylights

Par. 7660. The framing and sash of skylights shall be designed to support the same loads as required in Chapter 60 for the roof.

Skylights comprising glass roof construction of hollow glass blocks shall be designed and constructed as required for glass floor construction in Section 767.

Framing for Skylights

Par. 7661. The framing or curb for skylights shall be rigidly constructed and of such materials as required in Part V.

Where the skylight window forms an angle of less than 45 degrees with the horizontal, it shall be set at least one foot above the roof.

Sash for Skylights

Par. 7662. The sash for all skylights glazed with wire glass or laminated glass shall be of non-corroding metal or of metal protected against corrosion.

Glazing of Skylights

Par. 7663. The glazing in all skylights shall be of wire glass, except as follows:

a. In skylights which are required over shafts in Part V, and over hazardous rooms in Part IV.

b. In skylights over photographic studios, plain glass not less than one-quarter inch thick may be used.

The wire glass shall be at least one-quarter inch thick and the panes shall not exceed 720 square inches in area, nor 48 inches in any dimension.

Protection of Skylights

Par. 7664. Skylights glazed with plain glass, except over photographic studios, shall be protected on the outside by a wire screen.

Skylights with plain glass located over passageways, stairways, restaurants and places of Public or Private Assembly, shall also be protected on the inside by a wire screen.

The wire screen shall be of not less than No. 12 B & S gauge wire with a mesh not larger than one inch, fastened rigidly not less than 4 inches nor more than 10 inches from the plane of the glass it protects. The wire mesh shall overhang the edge of the skylight by an amount at least equal to its distance from the glass.

SECTION 767

FLOOR AND SIDEWALK LIGHTS

Design of Floor and Sidewalk Lights

Par. 7670. All parts of floor and sidewalk lights shall be designed to support the same loads as required in Chapter 60 for the floors or sidewalks in which they are located, except that floor lights surrounded by a fixed railing at least 3 feet 6 inches in height may be designed as skylights.

Framing for Floor and Sidewalk Lights

Par. 7671. The framing or sash of floor and sidewalk lights shall be of structural metal or reinforced concrete.

Glazing of Floor and Sidewalk Lights

Par. 7672. All glass panes used in floor and sidewalk lights shall be at least one-half inch thick. Such glass panes more than 16 square inches in area shall have wire mesh embedded in them or shall be provided with a wire screen underneath.

The wire screen shall be constructed as required in Paragraph 7664 for skylights.

Hollow glass blocks used in glass floor construction shall have wire mesh embedded in their top sections and shall be capable of supporting a load of 1000 pounds concentrated at the center of the top.

SECTION 768

LOUVERS

Construction of Louvers

Par. 7680. The frame and slats of louvers exposed to the weather shall be of metal protected against corrosion. Other louvers shall be of metal, except that they may be of wood in Type G, Wood Frame, buildings and in other buildings if permitted by the Buildings Engineer.

SECTION 769

SCUTTLES

Construction of Scuttles

Par. 7690. Scuttle openings shall be framed as required in Chapter 75, for openings in roofs.

Scuttles shall be provided with trap doors and constructed of such materials as required in Part V.

The scuttle opening shall be framed by a curb at least 3 inches high, measured from the finished roof.

CHAPTER 77

MEANS OF EGRESS

Sec. 770—General Requirements for Means of Egress.
Sec. 771—Fire Towers.
Sec. 772—Interior Stairways.
Sec. 773—Enclosed Exterior Stairways.
Sec. 774—Open Exterior Stairways.
Sec. 775—Horizontal Exits.
Sec. 776—Passageways
Sec. 777—Sliding Chute Fire Escapes.
Sec. 778—Standard Fire Escapes.
Sec. 779—Other Means of Egress.

SECTION 770

GENERAL REQUIREMENTS FOR MEANS OF EGRESS

Permitted Use of Means of Egress

Par. 7701. All means of egress shall be used in such locations and under such conditions as required and permitted in Part IV.

SECTION 771

FIRE TOWERS

Scope of Fire Towers

Par. 7710. Fire towers shall include every stair shaft completely enclosed with fire-resistive construction, in accordance with the requirements of this section.

Enclosure of Fire Towers

Par. 7711. Fire towers shall be enclosed by solid masonry walls, having a four-hour fire-resistive rating.

There shall be no openings in the walls separating a fire tower from the remainder of the building except the necessary doorways leading to vestibules required in Paragraph 7712, which shall be protected by self-closing Class A fire doors. All window openings in the exterior walls of fire towers shall be protected by fixed fire-resistive windows, but no such openings shall be permitted within five feet of property lines.

Access to Fire Towers

Par. 7712. Access from the stories to fire towers shall be through vestibules or balconies separated from the remainder of the building by three-hour fire-resistive walls and floors. Floors not forming a separation shall be of incombustible materials.

There shall be no openings in the walls and floors separating such vestibules from the remainder of the building, except the necessary exit doorways which shall be protected by self-closing Class D fire doors equipped with a clear wired glass pane. Window openings in the exterior walls of the vestibules shall be protected by fixed fire-resistive windows, except that they may be unprotected if they face an open space at least 20 feet wide and all openings within 10 feet of such window openings are protected by self-closing fire doors or fixed fire-resistive windows. No openings in the exterior walls of the vestibules shall be permitted within 5 feet of property lines.

Open balconies and unprotected openings in the vestibules shall be provided with balustrades as required for the stairs in the fire tower.

Egress from Fire Towers

Par. 7713. The exit doorway from a fire tower shall open directly to a street or to an open space leading to a street, or into a passageway leading to a street or such space. The enclosure of the passageway shall be of four-hour fire-resistive construction with all openings therein, except the doorway from the fire tower, protected by a vestibule and two self-closing Class A fire doors.

Construction of Stairs in Fire Towers

Par. 7714. Stairs in fire towers shall be constructed of reinforced concrete, steel, or other incombustible materials.

The headroom over stairs, the treads and risers, landings, balustrades and handrails of such stairs shall be as required for interior stairs in Section 772.

Ventilation of Fire Towers

Par. 7715. All fire towers shall be provided with an open ventilator, constructed of incombustible materials at or near the top. Such ventilators shall extend above the roof of the building.

SECTION 772

INTERIOR STAIRWAYS

Scope of Interior Stairways

Par. 7720. This section includes the requirements for construction details of all interior stairways.

Width of Interior Stairways

Par. 7722. The width of interior stairways shall never be less than 24 inches and if in required exits it shall be as specified for stairways in the exit requirements in Part IV.

The required width of stairways shall be the unobstructed width, except that handrails, attached to walls, may project not more than three and one-half inches on each side if the stairway is 44 inches or more in width, and on one side if the stairway is less than 44 inches wide. Where newels are used, the required width shall be measured from the face of the newel.

Enclosure of Interior Stairways

Par. 7723. The enclosure of interior stairways where required in Part IV, shall be constructed as required for the type of construction of the building in which the stairway is placed.

Where a stairway is in the same shaft with an elevator, or where a stairway surrounds an elevator, the elevator shall be entirely enclosed and separated from the stairway by a wall of two-hour fire-resistive construction.

Headroom over Interior Stairs

Par. 7724. All stairs shall have a clear headroom of not less than 6 feet 8 inches measured vertically above a riser.

Construction of Interior Stairways

Par. 7725. Interior stairways shall be of materials and assemblies in conformity with the type of the building in which they are placed.

When treads, landings, or platforms in required stairways are of slate, marble, stone or composition, they shall be supported for their entire length and width by a structural metal frame designed as required in Part VI.

Treads and Risers of Interior Stairways

Par. 7726. The treads and risers of interior stairways shall be solid and so proportioned that they will meet the requirements in Table 7726T, in which all dimensions are in inches:

TABLE 7726T

Location of Stairway	Sum of Two Risers and One Tread		Maximum Height of Riser	Minimum Width of Tread, exclusive of nosing
	Minimum	Maximum		
In required exits from Public or Private Assembly areas..	25	26	7¾	9
In required exits from Dwelling or Office areas in buildings not exceeding 3 stories or 35 feet in height........	24	28	9	9
In all other required exits....	24	26	8	9
All other locations............	24	28	..	..

The width of treads in stairs of three risers or less shall be not less than 12 inches. Treads less than 10 inches wide shall have nosings. All treads shall be of the same width and all risers of the same height in any one flight of stairs.

The use of winders in stairways in required exits is prohibited, except that in such stairways in the following locations, winders may be used:

a. In any private residence.

b. In dwellings not over 3 stories or 35 feet high, containing not more than 3 apartments or 10 bedrooms, but housing not more than 25 persons.

c. In spiral stairways, where such are permitted in Part IV.

In groups of winders, the tread and rise on the center line of the stairs shall meet the foregoing requirements for stairways in required exits. A group of winders in required exits shall not turn more than 180 degrees and a straight flight containing at least 6 risers shall intervene between such groups, except in spiral stairs.

Curved stairways of an ornamental character are permitted in required exits, if they are not less than 5 feet wide and if the tread and riser one foot from the inner rail meet the foregoing requirements for stairways in required exits and if the tread at the outer rail is not more than twice the tread one foot from the inner rail.

Landings in Interior Stairways

Par. 7727. The vertical rise between floors or between landings or between floors and landings of interior stairways shall be not more than 10 feet.

The length of landings between risers in straight runs of stairs shall be not less than 44 inches. When the stairs change direction by less than 90 degrees, the landings shall be made not less than 2 feet long on the shortest side, measured along the sides of the angle, but the length of the landing measured along the center of the stairway shall be not less than 44 inches. When the stairs change direction by 90 degrees or more, the width of the landings shall be not less than the width of the stairs.

Balustrades and Handrails of Interior Stairways

Par. 7728. The sides of the stairways shall be protected by the enclosing walls or by well secured balustrades so constructed that there shall be no openings large enough to pass a six-inch diameter ball. Such balustrades shall be at least 3 feet 6 inches high on the landings and not less than 3 feet high measured above the centers of treads.

When stairways are less than 44 inches wide, they shall have handrails on at least one side, and when they are 44 inches or more in width, they shall have handrails on both sides. When the width of a stairway is 88 inches or more, there shall be an intermediate handrail continuous between landings, but the number and position of intermediate handrails shall be such that there shall be not more than 66 inches between adjacent handrails.

There shall be a clear distance between the handrail and the wall of not less than 2 inches. All handrails shall be substantially secured to the walls or to the balustrades.

Handrails shall be of metal or hard wood, not less than 2 inches nor more than 3 inches in diameter, placed at a height of about 3 feet above the center of the treads. The ends of the handrails shall be returned to the wall or terminate at posts so as not to have free or projecting ends.

Space Under Interior Stairs

Par. 7729. The space between the soffit of interior stairs and the floor, where less than 4 feet high, shall be enclosed, without openings, for the full width of the stairs.

SECTION 773

ENCLOSED EXTERIOR STAIRWAYS

Scope of Enclosed Exterior Stairways

Par. 7730. Enclosed exterior stairways shall include every stairway constructed on the outside of buildings in accordance with the requirements of this Section.

Location of Enclosed Exterior Stairways

Par. 7731. Enclosed exterior stairways in required exits shall be located so as to have access to a street or other open space leading to a street.

No part of such stairways which are constructed of wood shall be within 5 feet of any adjoining property line.

Width of Enclosed Exterior Stairways

Par. 7732. The width of enclosed exterior stairways shall never be less than 24 inches and if they are in required exits it shall be as specified for stairways in the exit requirements in Part IV.

The required width shall be measured as required for interior stairways in Paragraph 7722.

Enclosure of Exterior Stairways

Par. 7733. Enclosed exterior stairways shall have roofs and sides of incombustible materials.

Openings in the exterior walls near such stairways in required exits shall be protected by self-closing Class D fire doors or fixed fire-resistive windows if they are within 15 feet horizontally, or within 30 feet vertically below or 8 feet above any part of such stairway.

Headroom Over Enclosed Exterior Stairs

Par. 7734. All enclosed exterior stairs shall have a clear headroom of not less than 7 feet measured vertically above a riser.

Construction of Enclosed Exterior Stairways

Par. 7735. No enclosed exterior stairway shall be supported by cantilever brackets on the walls of a building, but shall be supported on columns or on structural members attached to the framework of the building. The stairs and supports shall be of incombustible materials.

Treads and Risers of Enclosed Exterior Stairways

Par. 7736. Treads and risers of enclosed exterior stairways shall meet the requirements in Paragraph 7726 for treads and risers of interior stairways, except that winders shall not be permitted.

Landings of Enclosed Exterior Stairways

Par. 7737. The vertical rise between landings of enclosed exterior stairways shall not be over 10 feet.

Landings shall be not less than 4 feet in length and of the same width as the stairs.

Balustrades and Handrails on Enclosed Exterior Stairways

Par. 7738. The sides of stairs and landings not protected by an enclosure shall be guarded by a balustrade, as required for interior stairways in Paragraph 7728.

Metal handrails not less than 2 inches in diameter shall be provided on both sides of every exterior stairway and shall be continuous from top to bottom of such stairway, including landings. Handrails shall be substantially supported from the wall or balustrade 3 feet above the center of the tread. The clear distance between the handrail and the wall shall be not less than 2 inches.

SECTION 774

OPEN EXTERIOR STAIRWAYS

Scope of Open Exterior Stairways

Par. 7740. Open exterior stairways shall include all exterior stairways which are not in a fire tower or an enclosure, except fire escapes.

Location of Open Exterior Stairways

Par. 7741. Open exterior stairways constructed of wood shall not be placed less than 5 feet from an adjoining property line or a wood frame building, except the building to which it is attached.

Open exterior stairways in required exists shall not be placed in any court or alley which is less than 20 feet wide.

Width of Open Exterior Stairways

Par. 7742. The width of open exterior stairways, if they are placed in required exists, shall be determined as specified for stairways in the exit requirements in Part IV. Otherwise, it shall never be less than 2 feet.

The required width shall be measured as required for interior stairs in Paragraph 7722.

Openings Near Open Exterior Stairways

Par. 7743. Openings in the exterior walls near open exterior stairways in required exits, except near stairways permitted to be of wood, shall be protected by self-closing Class D fire doors or fire-resistive windows, if they are within 10 feet horizontally, or within 20 feet vertically below or 7 feet above any part of such stairway.

Headroom Over Open Exterior Stairs

Par. 7744. All open exterior stairs shall have a clear headroom of not less than 7 feet measured vertically above a riser.

Construction of Open Exterior Stairways

Par. 7745. Open exterior stairs and their supports shall be constructed of incombustible materials, except that such stairs attached to Type E, Ordinary, buildings not over 2000 square feet in area, and not more than 3 stories or 35 feet high, or to Type F, Metal, or Type G, Wood Frame, buildings, may be of wood.

Where bottom flights of such stairs are retractable, they shall be of the counterbalanced hinged type, without chains or cables.

Treads and Risers of Open Exterior Stairways

Par. 7746. The treads and risers of open exterior stairways shall meet the requirements in Paragraph 7726 for treads and risers in interior stairways, except that they shall not be required to be solid and that winders shall not be permitted.

Landings of Open Exterior Stairways

Par. 7747. The vertical rise between landings of open exterior stairways shall be not more than 10 feet.

Landings shall be not less than 4 feet in length and of the same width as stairs.

Balustrades and Handrails on Open Exterior Stairways

Par. 7748. Open exterior stairways shall be equipped with balustrades and handrails as required for protected exterior stairways in Paragraph 7738.

SECTION 775

HORIZONTAL EXISTS

General Requirements for Horizontal Exits

Par. 7750. Horizontal exits include all means of egress leading through a wall or walls from one fire division or building to another, including the necessary doorways, bridges, balconies, passageways, or similar means of egress.

Each access doorway to horizontal exits consisting of wall openings, passageways, tunnels and similar means of egress shall be protected with a Class A fire door. The requirements for access doorways to bridges and balconies are contained in Paragraph 7752.

Where the slope of the floor of bridges, balconies, passageways or similar means of egress in horizontal exits is greater than one vertical in ten horizontal, steps shall be provided.

Bridges and Balconies in Horizontal Exits

Par. 7752. All bridges and balconies in horizontal exits shall be constructed entirely of incombustible materials. Open bridges and balconies shall be provided with a railing or parapet at least 36 inches high.

The access doorways to such bridges and balconies shall be protected by self-closing Class A fire doors, except that doorways leading to open bridges or balconies may be protected by other types of doors, if there is a clear distance of at least 6 feet between the doorways where they are in the same plane or at least 10 feet between other doorways.

Openings, except access doorways, in the exterior building walls near such bridges or balconies shall be restricted as follows:

a. Near open bridges or balconies without any fire-resistive protection, all openings within a space extending 10 feet from either side of, 10 feet above and 50 feet below the bridge or balcony floor shall be protected by self-closing Class A fire doors or fixed fire-resistive windows, except that there shall be no openings in a space extending 5 feet from either side of, 10 feet above and 25 feet below the bridge or balcony floor.

b. Near bridges or balconies with supporting members and floors of two-hour fire-resistive construction and parapets of one-hour fire-resistive construction, all openings within a space extending 5 feet from either side of, 10 feet above, and 25 feet below the bridge or balcony floor shall be protected by self-closing Class A fire doors or fixed fire-resistive windows.

c. Near bridges or balconies with all supporting members, floors and parapets having a two-hour fire-resistive rating, in horizontal exits of Type A, Fireproof, or Type B, Fire-resistant, buildings used exclusively as dwellings, there are no restrictions for the openings.

d. Near bridges or balconies with supporting members and floors having a two-hour fire-resistive rating, enclosed on the sides and top with one-hour fire-resistive construction or fixed fire-resistive windows, there are no restrictions for the openings.

e. Bridges or balconies of other construction shall be considered unprotected open bridges or balconies.

Passageways in Horizontal Exits

Par. 7754. The enclosure and supports of passageways in horizontal exits shall be of two-hour fire-resistive construction.

Tunnels in Horizontal Exits

Par. 7755. Tunnels in horizontal exits shall be constructed in accordance with Paragraph 4915.

SECTION 776

PASSAGEWAYS

Scope of Passageways

Par. 7760. Passageways in this section shall include all corridors, hallways, alleys and other similar ways which are in required exits.

Width of Passageways

Par. 7761. The width of passageways shall be as required in Part IV.

Enclosures of Passageways

Par. 7762. The enclosing walls, floors and ceilings of passageways shall have a fire-resistive rating as required in Part

V, and shall be without openings other than the necessary doorways or stairways, except that show windows shall be permitted if they are in accordance with Paragraph 7768.

The walls shall have no recesses or projections less than 6 feet above the floor and no pegs, hooks or nails shall be placed in them.

Headroom in Passageways

Par. 7763. Passageways shall have a clear headroom of not less than 8 feet.

Inclined Passageways

Par. 7764. The floor of an inclined passageway shall be sloped not more than one foot in ten, except that at a door leading into the passageway or at the foot of a stairway, the floor shall be level across the entire width of the passageway and along its length for a distance of 12 inches more than the width of the door, and for a distance of not less than 44 inches at the foot of the stairway.

Encroachments Upon Width of Passageways

Par. 7765. Radiators, pipes, doors in an open position, and any other equipment or construction shall not be allowed to reduce or encroach upon the required width of a passageway.

Lockers in Passageways

Par. 7766. If lockers are to be placed along one or both sides of a passageway, the clear width of the passageway between lockers shall be increased over its required exit width by 18 inches for each side on which lockers are placed. If space in passageways is used for any purpose other than for lockers, the clear width of the passageway shall be increased over its required exit width as the Buildings Engineer shall in each case determine.

Passageways Below the Ground Surface

Par. 7767. Passageways below the ground surface shall be considered tunnels and constructed as required in Paragraph 4915.

Show Windows in Passageways

Par. 7768. Show or display windows, glass panels, or similar openings in the walls of passageways shall not be permitted where the room behind such windows is used for hazardous occupancy, and for rooms of other occupancies, show windows shall be permitted only under the following conditions:

a. In passageways leading directly to a street within 8 feet from the building line.

b. Other show windows shall be permitted in any passageway if their glass panes are protected by an automatic water curtain and the room behind the window is equipped with automatic Class A sprinklers for a depth of at least 25 feet and a length extending 10 feet beyond either end of the show window. The sprinklering of the room may be omitted if the show window is separated from the room by a one-hour fire-resistive wall, with all openings therein protected by Class B fire doors, but where the depth of such show window exceeds 3 feet, it shall be equipped in addition to the water curtain by automatic Class A sprinklers, for a depth not exceeding 25 feet. All sprinklers and the water curtain herein required shall be actuated by thermostats located at the glass pane, spaced not over 6 feet on centers and, in addition, by at least two thermostats located in the room near either end of the glass, at about 6 feet from the plane thereof.

All show windows in passageways shall be glazed with wired or polished plate glass at least one-quarter inch thick. The sills of such show windows shall be at least 3 feet 6 inches above the walkway level or they shall be protected by guards of sufficient strength to resist a horizontal pressure of at least 150 pounds per linear foot.

The required exit width of passageways shall be increased by 3 feet for each side on which show windows are placed.

Alleys and Courts in Exits

Par. 7769. Alleys and courts less than 20 feet in width shall not be permitted in required exits unless the walls on both sides thereof are of incombustible materials.

SECTION 777

SLIDING CHUTE FIRE ESCAPES

Scope of Sliding Chute Fire Escapes

Par. 7770. Sliding chute fire escapes shall include every means of egress in which persons escape by sliding down a specially designed chute.

Location of Sliding Chute Fire Escapes

Par. 7771. Sliding chute fire escapes shall be placed either inside or outside of buildings where permitted and located as required to serve the exit in which they are placed. Refer to exit requirements in Part IV.

Width of Sliding Chute Fire Escapes

Par. 7772. The width of sliding chutes are limited by standard construction and the requirements of Paragraph 7775.

Enclosure of Sliding Chute Fire Escapes

Par. 7773. All sliding chutes in required exits shall be completely enclosed. When a chute is placed in the interior of a building, it shall be enclosed by construction of the same fire-resistive rating as that required for the enclosure of vertical shafts in such building. When a chute is placed on the exterior of a building so that any part of it is 5 feet or less from a door, window, or other opening, it shall be enclosed by two-hour fire-resistive construction, or such doors, windows, or other openings shall be protected by Class D fire doors or fire-resistive windows. Otherwise, such chutes may be enclosed with metal or other incombustible material of equal durability.

Discharge Point of Sliding Chute Fire Escapes

Par. 7774. All chutes shall lead directly to a street, or to a yard or court connected with a street, or to a passageway leading to a street. Such passageways shall be entirely enclosed by two-hour fire-resistive unpierced construction, and shall be at least 44 inches wide, and not less than 8 feet in height for new buildings and 7 feet in height for existing buildings. Where chutes discharge, any opening within 5 feet of the chute opening shall be protected by Class D fire doors or fire-resistive windows.

Only such doors which will open by a light pressure are allowed at the bottom or discharge point of chute.

The lower edge of the chute at the discharge point shall be at least 12 inches and not more than 20 inches above the ground or walkway level. Where hospital pads are to be used on a chute, the lower end shall terminate in a straight, level discharge table at least 15 feet in length, so arranged as to allow access to both sides.

Design and Construction of Sliding Chute Fire Escapes

Par. 7775. Iron, steel, or concrete shall be used in the construction of chutes where structural strength is required; elsewhere other incombustible materials may also be used. No wood shall be employed.

Balconies shall be designed to carry a live load of 100 pounds per square foot.

Balcony and chute enclosures and railings shall be designed to withstand a horizontal pressure of 50 pounds per running foot of railing or enclosure without serious deflection.

The chutes and their supports shall be designed to carry the weight of the structure itself and 100 pounds per lineal foot of slide as measured at the middle of the slideway.

Slideways shall be made of galvanized or rustless steel so constructed as to provide a smooth sliding surface free from projections which may cause injury to the user.

In all chutes the slope shall be not less than 24 degrees and not more than 42 degrees with the horizontal. On spiral chutes the slope shall be measured by developing the spiral line on the cylindrical surface two feet from the inner edge.

On all straight chutes having slopes greater than 30 degrees, there shall be a section at the lower end at least 10 feet long, set at an angle not to exceed 15 degrees with the horizontal, connected with the upper section by a curved compensating section.

On spiral chutes, transition from one pitch interval to another, where necessary on account of differing story heights, shall be made by the use of compensating plates so that there is no perceptible interruption of the slide.

Spiral chutes shall be not less than 28 inches nor more than 42 inches wide. Straight chutes shall be not less than 24 inches nor more than 42 inches wide.

The slideways of spiral chutes shall be banked from a point 12 inches from the outer edge to a point 5 inches above the level of the center of the chute.

Spiral chutes shall extend to the roof if the slope of the roof does not exceed 5 degrees.

Doors to Sliding Chute Fire Escapes

Par. 776. Class B fire doors shall be provided at each entrance to a chute swinging in the direction of exit travel, and so constructed that they will not obstruct the use of the chute; the door openings shall be at least 30 inches wide and at least 6 feet 6 inches high.

SECTION 778

STANDARD FIRE ESCAPES

General Requirements for Standard Fire Escapes

Par. 7780. Standard fire escapes shall consist of exterior balconies or platforms connected by exterior stairs, all constructed of steel, iron or other incombustible material.

The stairs shall be constructed in openings in the platforms. The lowest platform shall be not more than 16 feet above the ground, with a minimum clearance under the stairs of 12 feet from the ground.

The top platform shall be connected to the roof by means of a goose-neck ladder.

Location of Standard Fire Escapes

Par. 7781. Standard fire escapes shall be wholly or partly supported on the exterior wall of a building and so located that they can be reached readily and safely by the occupants of the building.

Size of Standard Fire Escapes

Par. 7782. Standard fire escapes shall be of standard fixed general dimensions as required in this Section.

Openings Near Standard Fire Escapes

Par. 7783. Openings in the exterior walls near standard fire escapes shall be protected by self-closing Class D fire doors or fire-resistive windows if they are within 5 feet horizontally or vertically above or within 10 feet vertically below any part of such fire escape.

Design of Standard Fire Escapes

Par. 7785. Standard fire escapes shall be capable of sustaining a live load of 125 pounds per square foot, except the treads in stairs which shall be capable of sustaining a concentrated live load of 250 pounds at any point, without exceeding the unit stresses permitted in Section 632.

Stairs of Standard Fire Escapes

Par. 7786. Fire escape stairs shall rise at an angle of not more than 55 degrees. The treads shall be of cast iron or steel and not less than 7 inches in width and 20 inches in length. The rise of one tread above the other shall not be more than 10 inches. The string pieces shall be riveted and substantially connected to the frame of the platform at both the top and the bottom of the run. The run from one platform to another shall be continuous and straight.

The connecting stair to ground shall be fixed or may be counterbalanced or sliding so that it can be easily and quickly released, and so arranged that after releasing, the stair will immediately descend to a rigid position for use.

Balconies of Standard Fire Escapes

Par. 7787. Balconies or platforms of standard fire escapes shall be supported by posts, cantilever construction or by brackets. Brackets supporting balconies or platforms shall be not more than 12 feet apart. The top chord of the bracket shall be anchored or otherwise substantially secured to the wall.

Balconies shall be 3 feet 9 inches wide, and not more than one foot below the wall openings which they serve. They shall extend entirely across connecting windows and not less than 9 inches beyond the side of any such window. The landings at the foot of the stairs shall be not less than 24 inches long; and openings in balconies shall be sufficiently long to provide clear headroom.

Balconies shall be made of bars spaced with openings between them which are not less than one-half inch nor more than three-quarters inch wide.

Railings for Standard Fire Escapes

Par. 7788. Stairs of standard fire escapes shall be provided with handrails on both sides, substantially connected to the stairs and, where possible, to the balconies.

The open side of balconies shall be protected by railings substantially secured to the frame of the balcony. The end of the top rail shall be anchored or otherwise substantially secured to the wall. The bottom rail shall be not more than 6 inches above the balcony, the filling in bars shall be riveted to both the top and bottom rails, and the open spaces between them shall be not more than 6 inches wide. The height of the rail shall be not less than 3 feet.

Roof Ladders of Standard Fire Escapes

Par. 7789. Goose-neck ladders of standard fire escapes shall be not less than 16 inches wide in the clear, and the rungs shall be made of three-quarter inch square bars with corners turned up and down. Every other rung shall be riveted in place, and they shall be spaced 12 inches center to center.

SECTION 779

OTHER MEANS OF EGRESS

Ramps as Means of Egress

Par. 7791. Ramps serving as required means of egress shall not exceed in slope one foot in ten feet. When a door opens into a ramp, the floor of the ramp at doors and foot of stairs shall comply with the requirements for inclined passageways given in Section 776.

Ramps shall be provided with an approved non-slip surface.

Where ramps have a slope one foot in twelve feet or more, handrails shall be placed on both sides.

Ramps may be straight or curved in plan, or a combination of straight or curved portions. Lines on the floor of straight ramps normal to the direction of travel shall be level. Radial lines on the floor of curved ramps shall be level or raised not over one inch per foot of the width measured from the inside of the curve. The slope of curved ramps shall be measured two feet from the inner wall or railing. Other construction details of ramps and the protection of openings near exterior ramps shall be as required for stairways.

Escalators as Means of Egress

Par. 7793. Escalators shall be constructed as specified in Chapter 91.

Elevators as Means of Egress

Par. 7794. Passenger elevators shall conform to all the requirements in Chapter 91.

Ladders as Means of Egress

Par. 7796. Ladders shall not serve as means of egress except where specifically allowed in Part IV and in this Chapter. A ladder not more than one story or 15 feet in height may serve as a means of egress where a scuttle is required.

Ladders serving as means of egress shall be either chained or permanently fixed in place.

Rungs of such ladders shall be uniformly spaced, not over 12 inches on centers, and shall be supported by two rails not less than 16 inches apart.

Exterior ladders leading to a roof shall have rails extending at least 45 inches above the roof line, coping or parapet. The extensions of the side rails shall be carried over copings or parapets to afford a hand hold.

Such exterior ladders shall be made of iron or steel, with rails not less than two inches by one-half inch and rungs not less than seven-eights inch in diameter, riveted in place. The distance between rails shall be not less than 16 inches and between rungs not more than 12 inches, with the top rung within 6 inches of the roof or parapet line.

Ladders shall be vertical, or inclined, but no negatively inclined ladder shall be permitted.

Adjoining Roofs as Means of Egress

Par. 7797. Adjoining roofs to be used as a means of egress, when permitted under special conditions by the Buildings Engineer, shall be not more than 12 feet higher or lower than the roof to be served. A ladder or stair shall be provided if the difference in levels is more than 2 feet.

Glass Panel Doors as Means of Egress

Par. 7798. Glass panels in doors when permitted as means of egress under special conditions by the Buildings Engineer, shall be not less than 20 inches wide by 60 inches high. A wooden mallet not less than 3 inches in diameter by 6 inches with handle not less than 30 inches long shall be fastened with a chain to each side of such door.

Not more than one such door shall be permitted in a required exit.

Miscellaneous Means of Egress

Par. 7799. Poles, ropes, nets and other devices may be permitted as means of egress by the Buildings Engineer in locations allowed in Part IV, if required in an extreme emergency. They shall conform in all respects to such requirements as the Buildings Engineer shall in any case prescribe.

CHAPTER 78

PROJECTIONS AND ACCESSORIES TO BUILDINGS

Sec. 781—Porches, Balconies and Oriels.
Sec. 783—Marquees.
Sec. 784—Built-In Chimneys.
Sec. 786—Steeples and Towers.
Sec. 787—Cornices.
Sec. 788—Steps and Subsurface Openings.
Sec. 789—Exit Signs.

SECTION 781

PORCHES, BALCONIES AND ORIELS

Scope of Porches, Balconies and Oriels

Par. 7810. This Section includes the construction details for porches, oriels, and exterior balconies.

Location of Porches and Balconies

Par. 7811. Every porch or balcony, or parts thereof, shall be at least one foot six inches from any adjoining property line, except porches on the first floor in front of row houses may be continuous.

Framing for Porches, Balconies and Oriels

Par. 7812. The structural framing for the floors of porches, balconies and oriels shall conform to the requirements for framing of floors in Chapter 75.

Bolts in tension, fastening the supporting trusses or brackets to the walls, shall be through-bolts.

All exposed metal shall be non-corroding or protected against corrosion.

Railings on Porches and Balconies

Par. 7813. All porches and balconies which are more than 5 feet above the ground level immediately below shall be provided with a railing or balustrade at least 2 feet 10 inches high, and so constructed that there shall be no opening large enough to pass a 6 inch diameter ball.

Such railing may be omitted at the entrance from stairs and ramps.

Railings shall be designed in accordance with Paragraph 6057.

Roofs Over Porches, Balconies and Oriels

Par. 7814. Roofs over porches, balconies and oriels shall be constructed as required in Chapter 75 for roofs.

All such roofs shall be sloped to drain into gutters and downspouts.

SECTION 783

MARQUEES

Scope of Marquees

Par. 7830. This section includes the construction details for movable awnings supported entirely on the wall of a building, and for all marquees and detachable canopies.

Framing for Marquees

Par. 7831. Cantilever beams or girders supporting marquees shall extend beyond the inside face of the supporting wall for a distance at least equal to two-thirds of the projection of the marquee, unless they are suspended or otherwise supported near their outside end.

Suspending rods shall be at least one inch in diameter or one inch in the least dimension, and shall be attached to the wall by through-bolts, or connected to the structural frame of the building. Turnbuckles used on suspension rods shall have have upset threads. No open hooks shall be permitted on suspension rods.

Where suspension chains are used, they shall be of at least one-half inch diameter stock, with forged or welded eyes having no inner radius less than half the diameter of the stock.

The framing shall be designed to support the loads required for roofs in Chapter 60.

All exposed metal shall be non-corroding or protected against corrosion.

Draining of Marquees

Par. 7832. Marquees and similar structures shall be sloped to drain into gutters and downspouts.

Movable Awnings

Par. 7833. Movable awnings shall be supported by a rigid metal framework attached securely to the building.

For clearances under awnings and their maximum projections, refer to Paragraphs 2162 and 2155.

Detachable Canopies

Par. 7834. Detachable canopies shall have a metal framework and supports designed to resist wind pressure and snow loads. The stanchions supporting such canopies shall be securely fastened to the sidewalk and shall be provided with guy wires or other metal bracing.

For the clearances under canopies and their maximum projections refer to Paragraph 2154.

SECTION 784

BUILT-IN CHIMNEYS

Scope of Built-In Chimney Regulations

Par. 7840. This section includes the construction of masonry or metal chimneys, stacks, smoke flues, or vents, accessory to a building by being in the interior thereof, or by forming a part of or being attached to its walls and intended for the purpose of removing the products of combustion from solid, liquid or gaseous fuels.

For the construction of independent or free-standing masonry or metal chimneys, refer to Section 492.

Classification of Chimneys

Par. 7841. Chimneys, except those for incinerators, shall be classified according to the temperature of the gases at the point of entrance to the chimney. When such temperatures are less than 500 degrees Fahrenheit, the chimneys shall be classified as "low temperature chimneys"; when they vary from 500 to 1000 degrees Fahrenheit, the chimneys shall be classified as "medium temperature chimneys"; and when over 1000 degrees Fahrenheit, the chimneys shall be classified as "high temperature chimneys".

Built-In Masonry Chimneys

Par. 7842. The walls of built-in masonry chimneys shall be of brick, stone, cast stone, concrete blocks, except cinder blocks, structural clay tile or concrete with such lining as is specified in Paragraph 7845.

A chimney shall suport no vertical loads, except its own weight, but this provision shall not apply to masonry bonded to a chimney outside the required thickness thereof, nor shall it be held to forbid a suspended staging for construction or maintenance.

No chimney shall be corbeled from a masonry wall more than the thickness of the wall or from a wall which is less than 12 inches thick. The corbeling of chimneys shall also conform to the provisions of Paragraph 7143. Unless corbeled from a masonry wall, a chimney shall be supported upon a footing of masonry or reinforced concrete conforming to the provisions of Section 709; upon the furnace which it serves if of masonry and capable of supporting the chimney; or upon framing protected with a three-hour fire-resistive covering.

All walls of chimneys shall be finished on top with single blocks of stone, terra cotta, or concrete, or with cast iron plates or the masonry courses shall be properly bonded together for a distance from the top equal to not less than twice the diameter of the chimney or the largest dimension of the largest flue.

Masonry for chimneys shall be constructed in accordance with the requirements of Chapters 61, 71, and 72, and laid with full beds and joints. Mortar used shall be Portland cement mortar, cement-lime mortar or lime-cent mortar, and all exposed beds and joints, both inside and outside, shall be struck smooth.

The walls of brick chimneys used for low temperatures shall be at least 8 inches thick, except that brick chimneys used exclusively for ordinary stoves, domestic ranges and furnaces, or open fireplaces, and built integral with the masonry walls of buildings, may have the walls not less than three and three-quarter inches thick. All such low temperature chimneys shall be lined, except as permitted below, with fire clay flue lining extending as required in Paragraph 7845 or with not less than 4 inches of fire brick starting at a point 8 inches below the intake and extending for a distance of at least 25 feet above the intake. The brick lining may be the inner course of the chimney 8 inches or more in thickness. The lining may be omitted for low-temperature chimneys with a flue opening of 256 square inches or less, and having a wall of burned clay brick, at least 8 inches thick.

The walls of brick chimneys used for medium temperatures shall be at least 8 inches thick and, in addition, shall be lined with not less than 4 inches of fire brick, starting at a point 2 feet below the intake, and extending to the top, or for a distance of not less than 50 feet above the intake.

Brick chimneys used for high temperatures shall be built with double walls, each not less than 8 inches thick, with an air space of not less than 2 inches between them. The inner course of the interior walls shall be of fire brick not less than 4 inches thick.

The walls of low temperature stone chimneys shall be 8 inches thick when the masonry is of sawed or dressed stone in courses, well bonded at corners and tied with anchors of non-corrodible metal or metal protected against corrosion. Chimney walls of other stone masonry shall be not less than 12 inches thick. All such low temperature stone chimneys shall be lined as required for low temperature brick chimneys, except that brick lining shall not be included in the required thickness of the wall.

The walls of stone chimneys used for medium temperatures shall not be less than 12 inches thick and, in addition, shall be lined as required for medium temperature brick chimneys.

Stone chimneys used for high temperatures shall be constructed as required for high temperature brick chimneys, except that walls of masonry other than sawed stone in courses shall be at least 12 inches thick.

Chimneys of concrete cast in place shall be reinforced for shrinkage and temperature stresses. The thickness of walls and the requirements for the lining shall be at least equal to that specified for brick chimneys, except that flue linings may be omitted in reinforced concrete chimneys used for ordinary stoves, domestic ranges and furnaces, or open fireplaces, when the walls of such chimneys are not less than 6 inches thick.

Structural clay load-bearing tile and hollow or solid concrete block in chimneys shall be so laid that the ends of cells are not exposed. Other hollow clay tile shall not be used. The thickness and lining of such chimneys shall be as required for brick chimneys, except that no chimney wall shall be less than 8 inches thick.

Hollow concrete block masonry shall not be used in a chimney bonded to a wall which is more than 30 feet high.

Height of Built-In Chimneys

Par. 7843. Built-in chimneys, except those for incinerators, shall extend at least 3 feet above flat roofs and 2 feet above the ridges of peak roofs when such peaks are within 30 feet of the chimney.

Chimneys of cupola furnaces, blast furnaces and similar devices shall extend at least 20 feet above the highest point of any roof within a radius of 50 feet thereof, except that chimneys of cupola furnaces in school structures which are used only occasionally for instruction purposes shall extend at least 10 feet above the roof, and be covered on top with a screen constructed as required in Paragraph 9488.

When the height of a chimney above its highest lateral support exceeds four times its least lateral dimension, it shall be designed for wind forces in accordance with Section 492.

Any dispute caused by the construction of any wall or structure near a stack, chimney or flue of any adjoining structure to a greater height than such adjoining structure so as to prevent proper up-draft or cause down-draft in the stack, chimney or flue, or cause the smoke, odor, dust or gases emitted therefrom to create a nuisance, shall be considered a civil matter and outside the province of this Code.

Wood Near Built-In Chimneys

Par. 7844. No built-in chimney shall be built nearer than 2 inches from wooden floor or roof joists or nearer than one inch from wooden studding, furring or other woodwork. The space about a chimney shall be firestopped at each floor and ceiling level with incombustible material as required in Paragraph 5916, unless such space is treated as a vertical opening and is enclosed as provided in Part IV.

In case wooden beams, or other woodwork, are supported on a masonry wall or pier bonded to a chimney, such woodwork shall not be nearer than 4 inches from the chimney.

No woodwork or other combustible material or construction shall be erected or placed within 3 feet of a cupola furnace, blast furnace and similar devices and the chimneys serving them.

Flues in Built-In Chimneys

Par. 7845. Flues in built-in chimneys shall be built as nearly vertical as possible and in no case at an angle greater than 30 degrees from the vertical.

Flues, except for oil and gas burning appliances, shall have a well not less than 12 inches deep below the entrance of the lowest smoke pipe. Such well shall be provided with a tight-fitting metal clean-out door with built-in frame.

Smoke pipe intakes shall consist of fire clay or metal thimbles securely set in the chimney wall, or cast in concrete. Such openings shall be at least 18 inches from wood or other combustible construction, except where such wood or combustible construction is protected in an approved manner by incombustible insulation, in which case the distance shall be at least 9 inches.

Flues used for venting appliances that give off grease or grease-laden fumes shall be constructed and used entirely independently of other flues, and shall conform to the requirements of this section.

No flue shall have smoke pipe connections in more than one story of a building.

Lining, where required, shall consist of fire brick or burned fire clay flue lining or cast iron, except that sheet metal flue lining, enclosed in masonry, may be used for the repair or alteration of existing flues for ordinary stoves, ranges, domestic furnaces.

Burned fire clay flue linings shall be made of fire clay or of other suitable refractory clays adapted to withstand reasonably high temperatures and the action of flue gases and shall have a softening point not lower than 1994 degrees Fahrenheit (Seger Cone 03). Such flue linings shall be not less than five-eighths inch in thickness and shall be built in as the outer walls of the chimney are constructed. All joints and spaces between the masonry and lining shall be thoroughly slushed and grouted full as each course of masonry is laid. Cracked, broken or otherwise defective linings shall not be used. Fire clay flue linings shall start from a point not less than 8 inches below the smoke pipe or intake or, in the case of fireplaces, from the apex of the smoke chamber and shall be continuous to a point not less than 4 inches above the enclosing chimney walls. Where more than one flue is installed within a chimney, the linings shall be separated, one from the other, by a wythe of cement grouting at least one inch thick, or by a division wall of brick or concrete, at least three and three-quarter inches thick, bonded to the walls of the chimney, but there shall be one such division wall spaced not over 30 inches horizontally in any case. Linings in flues intended for heating furnaces or boilers shall be separated from other flues by a wythe at least three and three-quarter inches thick.

Fire brick shall have a fire-resistance at least equal to that required for the burned fire clay flue lining and shall be laid in fire clay mortar.

Cast iron flue lining shall be of an approved quality, form and construction.

Sheet metal flue lining shall be at least as thick as No. 12 U. S. gauge except that the 8 feet immediately below the flue outlet shall be at least as thick as No. 10 gauge.

No mortar lining or pargeting will be permitted.

For sizes of flues, refer to Paragraph 9481.

Built-In Masonry Incinerator Chimneys

Par. 7846. For Class A incinerators in which the grate area of the combustion chamber is 9 square feet or less, the walls of brick chimneys shall be at least three and three-quarter inches thick and shall be lined with fire clay flue lining or fire brick throughout.

For Class A incinerators in which the grate of the combustion chamber exceeds 9 square feet in area, the walls of brick chimneys shall be at least three and three-quarter inches thick and lined for a distance of at least 30 feet above the roof of the combustion chamber with four and one-half inches of fire brick; above this point the chimney wall shall be constructed with at least 8 inches of brick masonry.

For Class B incinerators, the chimney walls shall be as required for Class A incinerators with combustion chambers exceeding 9 square feet in area, but the fire brick lining shall extend at least 40 feet above the roof of the combustion chamber.

For Class C incinerators, the walls of brick chimneys shall be at least 8 inches thick and lined with fire brick at least four and one-half inches thick laid in fire clay mortar for the full height of the chimney.

The walls of all incinerator chimneys constructed of other masonry materials or reinforced concrete shall be not less than 8 inches thick, except that walls of stone not sawed and tied with metal anchors shall be at least 12 inches thick. The lining of such chimneys shall be the same as required for incinerator chimneys of brick masonry.

The connection of a Class B or Class C incinerator to a boiler stack or chimney for a high temperature heating device shall be permitted by means of an approved breeching, provided the cross-sectional area of such stack or chimney is at least 4 times that of the incinerator breeching.

Chimneys for incinerators shall extend at least 4 feet above the roof.

In all other respects chimneys for incinerators shall conform to the applicable requirements for other chimneys in this Section.

Built-In Metal Chimneys

Par. 7847. A built-in metal chimney shall support no vertical load other than its own weight. It shall be supported by incombustible construction or by the construction supporting the furnace which it serves, or may be mounted directly upon and supported by the boiler or furnace which it serves if such boiler or furnace is designed and constructed to support safely the weight thereof.

The material entering into metal chimney construction, or serving as the support thereof, shall be stressed within the allowable stresses stated in Part VI. The metal work shall be riveted or welded and of adequate thickness, but at least as thick as the following:

Diameter	Thickness
Not more than 14 inches	No. 16 U. S. Gauge
More than 14, not over 16 inches	No. 14 U. S. Gauge
More than 16, not over 18 inches	No. 12 U. S. Gauge
More than 18, not over 24 inches	No. 10 U. S. Gauge
More than 24, not over 30 inches	3/16 inch
More than 30, not over 48 inches	1/4 inch
More than 48, not over 60 inches	5/16 inch

Where a metal chimney is mounted on the outside of a building and supported by and secured to the exterior wall thereof, and the wall is of combustible materials, the chimney shall be not less than one-third its diameter, but never less than 4 inches away from such wall, and the wall, for a width not less than twice the diameter of the chimney, shall be covered with one-quarter inch of asbestos and sheet metal.

A metal chimney, or part thereof, erected within a building, other than a one-story building, shall be enclosed above the story in which the appliance served thereby is located, in walls of masonry at least 8 inches thick, except that in Type A, Fire-proof, or Type B, Fire-resistant, buildings, such enclosure may be of solid masonry at least 4 inches thick, provided the chimney is covered with at least 2 inches of approved incombustible insulating material. There shall be a space left between the chimney and the enclosing walls, sufficient to render the entire chimney accessible for examination and repair, but in no case shall this space be less than 4 inches. The enclosing walls shall be without openings except doorways equipped with approved self-closing fire doors at various floor levels for inspection purposes.

Where a metal chimney passes through a roof constructed of combustible materials, it shall be guarded by a galvanized iron ventilating thimble extending not less than 9 inches below and 9 inches above such roof construction. Such thimbles shall be of a size to provide a clearance on all sides of the stack of not less than 18 inches, except that for low temperature chimneys the clearance may be reduced to not less than 12 inches.

If a metal chimney is within a shaft or other enclosure of a vertical opening, provision shall be made for ventilating the shaft or enclosure at the bottom and above the roof.

Metal chimneys, except for low temperatures, shall be lined with fire brick for a distance of not less than 25 feet above the intake.

All pertinent provisions for masonry chimneys, shall also apply to metal chimneys.

Gas Flues

Par. 7848. Gas furnaces, gas water heaters and other gas appliances regulated in Section 946, which are required to be connected to a flue may, in lieu of the chimney required in this Section be provided with a flue of unglazed fire clay or concrete tile pipe not less than one-half inch in thickness and having a sleeve or flange at every joint. Such sleeves or flanges shall project at least three-fourths of an inch beyond the outer surface of the joint and shall securely join the sections of the flue and all joints shall be well cemented. The sleeves or flanges shall be securely attached to the portions of the building or structure adjoining the flue, and act as a spacer to provide an airspace around the flue, or the flue may be entirely enclosed in a galvanized iron pipe with such sleeves or flanges separating the outer pipe at least one-half inch from the clay or concrete flue.

Every flue shall extend in as nearly a vertical position as possible and be continuous from the gas appliance to the outside of the building and extend at least 2 feet above any portion of the roof within 15 feet of said flue.

Testing And Maintenance of Built-In Chimneys

Par. 7849. All flues to which large ranges, heating furnaces, boilers, automatic gas water heaters or fireplaces are to be connected shall be subjected to a smoke test before acceptance, but the test shall not be made until the mortar has thoroughly seasoned. Such test shall be made by the masonry contractor in the presence of the Buildings Engineer.

After a chimney has been completed, all flues shall be thoroughly cleaned and left smooth on the inside.

Any chimney which may be dangerous in any manner whatever shall be repaired and made safe, or taken down.

SECTION 786.

STEEPLES AND TOWERS

Scope of Steeples and Towers

Par. 7860. Steeples and towers in this Section shall include all towers, steeples, spires, domes and belfries erected on the roofs of buildings or on the ground.

Framing for Steeples and Towers

Par. 7862. The structural framework of independent towers erected on the ground shall be of structural metal or reinforced concrete, except where the distance from such towers to the nearest property or street line is at least equal to their height, in which case the structural framework may be of wood.

Protection of Steeples and Towers

Par. 7863. Exposed metal parts or framework of steeples and towers shall be protected against corrosion.

The roof on all steeples and towers shall be covered with fire-retardant roofing.

SECTION 787.

CORNICES

Scope of Cornices

Par. 7870. Cornices in this Section shall include all masonry, metal, wood and other cornices projecting beyond the face of a wall.

Construction of Cornices

Par. 7871. Sheet metal cornices shall be supported on structural metal lookouts and the tops of the lookouts shall be solidly sheathed.

Cornices made of concrete shall be reinforced.

All cornices shall be designed for a live load as required in Chapter 60.

Where a cornice extends or is placed above the roof line the full thickness of required parapet walls shall extend to the top of the cornice.

Anchoring Cornices

Par. 7872. Cornices or their framework shall be securely attached or anchored to the walls of the building.

Where the exterior wall is supported on a framework, the cornices or their brackets shall be connected to such framework.

Where anchors are used to attach cornices to masonry walls without framing, the anchors shall be of non-corroding metal, or metal protected against corrosion, not less than 2 inches by five-sixteenths of an inch in cross-section, embedded at least 6 inches into the masonry and spaced not over 4 feet apart.

Where no special anchors or brackets connected to a framing of the building are used, cornices on masonry walls shall be so placed that the gravity line of the cornice, or the resultant gravity line of the cornice and the surmounting masonry shall fall within the middle third of the wall immediately below the cornice. In every case, the bed of such cornices shall be at least one inch greater in depth than their maximum projection.

Wooden cornices attached to framed walls shall be securely nailed or bolted to the framework of the wall.

Protection of Cornices

Par. 7873. The top of all cornices shall be covered with a non-corroding metal flashing extending from the face of the wall to at least within 2 inches of the edge of the cornice. Such coverings shall be flashed into the wall and shall be of not less than No. 26 U. S. Standard gauge.

Replacing and Repairing Cornices

Par. 7874. New cornices constructed on existing buildings or cornices replacing an old cornice shall be in accordance with this Section and Part V. Minor repairs to existing cornices may be permitted by the Buildings Engineer, at his direction.

SECTION 788

STEPS AND SUBSURFACE OPENINGS

Scope of Steps and Subsurface Openings

Par. 7880. This section includes the construction requirements for steps and areas, areaways, cellar doors, hatch covers, coal holes and similar subsurface openings, attached or constructed adjacent to the exterior walls of a building.

Projections of Steps and Subsurface Openings

Par. 7881. Steps and subsurface openings shall not project into streets, alleys or other public ways more than is permitted in Section 213.

Construction of Steps

Par. 7882. Exterior steps shall be constructed of wood, metal, masonry materials, and other hard, durable materials.

The treads and risers of steps shall be proportioned as required in Paragraph 7746 for open exterior stairways.

Construction of Areas and Areaways

Par. 7883. All parts of areas and areaways shall be constructed of incombustible materials, except that the stairs in areaways attached to Type E, Ordinary, and Type G, Wood Frame, buildings may be of wood.

The treads and risers of the stairs shall be proportioned as required in Paragraph 7746 for exterior stairways.

Protection of Areas and Areaways

Par. 7884. All areas and areaways projecting into streets, alleys or other public ways shall be protected as herein required. Other areas and areaways shall be protected as required by the Buildings Engineer to prevent the existence of a hazardous condition.

Areas and covered areaways shall be provided with an approved incombustible cover at sidewalk level, designed to support the live load specified for the sidewalk in which they are placed or any other live load they may be subjected to. Where such cover is an open grating, the openings therein shall not be large enough to pass a three-quarter-inch diameter ball.

Means shall be provided to prevent persons falling into areas or areaways while the covers are open.

Open areaways shall be provided with a substantial incombustible handrailing not less than 3 feet 6 inches high, having no openings large enough to pass a four-inch diameter ball.

Cellar Doors and Coal Holes

Par. 7885. Cellar doors and coal hole covers and frames shall be of metal construction with checkered or non-skid surfaces, designed to support the live load specified for the sidewalk in which they are placed or any other live load they may be subjected to. They shall be placed flush with the sidewalk surface, with no hinge or handle projecting above the surface.

Cellar doors shall be not more than 5 feet in length at right angles to the curb nor more than 7 feet parallel thereto.

Substantial means shall be provided to prevent persons falling into cellar ways or coal holes while the doors or covers are open.

Hatch Covers Over Shafts

Par. 7886. All shafts for ash hoists, sidewalk elevators and other similar hoists shall not exceed 50 square feet in area and shall be covered as required in Paragraph 9111.

SECTION 789

EXIT SIGNS

Internally Illuminated Exit Signs

Par. 7891. Internally illuminated exit signs shall bear the word EXIT in plain legible letters not less than 6 inches high with principal strokes not less than three-quarters of an inch in width. Internally illuminated directional signs shall bear the words TO EXIT in the same letters and, in addition, a suitable pointer or arrow indicating the way. The letters and pointer or arrow shall be of green translucent material placed in an opaque field.

Painted Exit Signs

Par. 7892. Painted exit signs shall bear the word EXIT in plain legible letters not less than 6 inches high with principal strokes not less than three-quarters of an inch in width. Painted directional signs shall bear the words TO EXIT in the same letters and, in addition, a suitable pointer or arrow indicating the way. The letters and pointer or arrow shall be white on a green field.

Such signs shall be suitably illuminated by a reliable light source giving an intensity of not less than 5 foot-candles on the illuminated surface.

PART VIII

ELECTRICAL REGULATIONS

Chap. 80—General Electrical Regulations.

Chap. 81—Construction of Electrical Equipment and Materials.

Chap. 82—Wiring Methods.

Chap. 83—Installation of Electrical Equipment.

Chap. 84—Installation of Electrical Equipment in Special Locations.

Chap. 85—Overcurrent Protection.

Chap. 86—Grounding.

Chap. 87—Circuits and Equipment Operating at More Than 600 Volts Between Conductors.

Chap. 88—Sound Systems, Radio Equipment, and X-Ray and Similar Equipment.

Chap. 89—Miscellaneous Electrical Installations.

CHAPTER 80

GENERAL ELECTRICAL REGULATIONS

Sec. 800—General Electrical Requirements

Sec. 801—Electrical Definitions.

Sec. 802—Installations Prohibited.

Sec. 803—Design of Feeders.

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Sec. 805—Tables of Conductor and Conduit Sizes.

Sec. 806—Tables for Motors and Motor Circuits.

SECTION 800

GENERAL ELECTRICAL REQUIREMENTS

Scope of Electrical Requirements

Par. 8000. This Part (VIII) of the Building Code applies to electric conductors and equipment installed within or on all premises, buildings and other structures, including yards, carnival and parking lots, and industrial substations; and also the conductors that connect the installations to a supply of electricity and other outside conductors adjacent to the premises. It does not apply to installations in underground shafts and tunnels, ships, railway cars, automotive equipment, or the special installations or equipment employed by an electric transportation, power, or communication utility in the exercise of its function as a utility and located in buildings used exclusively for that purpose, or outdoors.

Applications and Permits For Electrical Work

Par. 8001. Applications shall be filed and permits secured for electrical work as required in Sections 135 and 145.

The fees given in Section 174 shall be paid in accordance with the requirements of Part I of this Code.

Electrical Certificates

Par. 8002. Upon the satisfactory completion of all electrical work done under an electrical permit, an electrical certificate shall be issued in accordance with Section 156.

Electrical Inspections

Par. 8003. Electrical inspections shall be made as required by Section 165.

Penalties For Violations of Electrical Regulations

Par. 8004. For penalties for violations of the electrical regulations, refer to Sections 191 and 192.

Approved Materials and Methods for Electrical Installations

Par. 8005. Only such electrical materials and equipment as are approved by the Buildings Engineer shall be permitted to be installed. The Buildings Engineer shall approve all materials and equipment that are approved by the Underwriters' Laboratories, Incorporated, except such materials and equipment as are not permitted to be installed by other Sections of this Code.

Except for new wiring methods permitted in accordance with Par. 8006, only the wiring methods described in Chapter 82 with the restrictions given therein, shall be permitted to be installed.

New Materials and Methods for Electrical Installations

Par. 8006. New materials and methods of installation, consistent with the intent of this Code, may be used only with the specific approval of the Buildings Engineer.

Investigation of Materials and Equipment for Electrical Installations

Par. 8007. Materials, devices, fittings, apparatus, and appliances designed for use under this Code shall be judged chiefly with reference to the following considerations which also determine the classification by types, sizes, voltages, current capacities, and specific uses:

Suitability for installation and use in conformity with the requirements of this Code.

Mechanical strength and durability, including, for parts designed to enclose and protect other equipment, the adequacy of the protection thus provided.

Electrical insulation.

Heating effects under normal conditions of use and also under abnormal conditions liable to rise in service.

Arcing effects.

Material of Conductors

Par. 8008. Where conductor sizes are given in this Code they shall apply to copper conductors of 98 per cent conductivity. When other materials are used the sizes shall be determined in accordance with the mechanical and electrical requirements of the installation to the satisfaction of the Buildings Engineer.

Existing Electrical Work

Par. 8009. All existing electrical equipment, appliances, wiring and other electrical work in service which does not comply with the provisions of this Code shall be made to conform to the requirements of this Code or put out of service and sealed or removed as directed in writing by the Buildings Engineer if such electrical equipment, appliances, wiring or other electrical work or the location thereof is or creates a menace to either life or property.

SECTION 801

ELECTRICAL DEFINITIONS

Definitions of Electrical Terms

Par. 8010. The definitions contained in this Paragraph of certain terms and nomenclatures are to apply for the correct interpretation and application of the same terms and nomenclatures when they appear elsewhere in this Code.

For definitions of terms and nomenclatures not so listed, reference shall be made to the standard definitions of electrical terms.

Accessible: When applied to wiring methods—not permanently closed in by the structure or finish of the building; capable of being removed without disturbing the building structure or finish. When applied to equipment—admitting close approach because not guarded by locked doors, elevations or other effective means. (See "Readily Accessible".)

Adjustable-Speed Motor: One in which the speed can be varied gradually over a considerable range, but when once adjusted remains practically unaffected by the load, such as shunt motors designed for a variation of field strength.

Appliance: Appliances are current-consuming equipment, fixed or portable.

Automatic Door: One which closes automatically by means of a device operated by heat.

Branch Circuit: That portion of a wiring system extending beyond the final overcurrent device capable of protecting the circuit against short-circuit currents.

Cabinet: An enclosure designed either for surface or flush mounting, and provided with a frame, matt or trim in which swinging doors are hung. (See cutout box.)

Cable: A stranded conductor (single-conductor cable) or a combination of conductors insulated from one another (multiple-conductor cable.)

Circuit-Breaker: A device designed to open under abnormal conditions a current-carrying circuit without injury to itself. The term as used in this Code applies only to the type designed to automatically trip on a predetermined over-load of current.

Concealed: Rendered inaccessible by the structure or finish of the building. Wires in concealed raceways are considered concealed, even though they may become accessible by withdrawing them.

Conductor: A wire or cable or other form of metal suitable for carrying current.

Connector, Pressure (Solderless): A pressure connector is a connector in which contact between the conductor and the connector is obtained without the use of solder by means of mechanically applied pressure.

Controller: A device, or group of devices, which serve to govern, in some predetermined manner, electric power delivered to the device governed.

Cutout Box: An enclosure designed for surface mounting and having swinging doors or covers secured directly to and telescoping with the walls of the box proper. (See cabinet.)

D. C. Neutral Grid: A well grounded network of neutral conductors formed by connecting together within a given area all of the neutral conductors of a low-voltage direct-current supply system.

Demand Factor: The demand factor of any system or part of a system, is the ratio of the maximum demand of the system, or part of a system, to the total connected load of the system, or of the part of the system under consideration.

Device: A unit of an electrical system which is intended to carry but not consume electrical energy.

Dustproof: So constructed or protected that an accumulation of dust will not interfere with its successful operation.

Dust-Tight: So constructed that dust will not enter the enclosing case.

Duty:

> *Continuous:* Continuous duty is a requirement of service that demands operation at a substantially constant load for an indefinite time.
>
> *Intermittent:* Intermittent duty is a requirement of service that demands operation for alternate intervals of (1) load and no load; or (2) load and rest; or (3) load, no load and rest.
>
> *Periodic:* Periodic duty is a type of intermittent duty in which the load conditions are recurrent at regular intervals.
>
> *Short-Time:* Short-time duty is a requirement of service that demands operation at a substantially constant load for a short and definitely specified time.
>
> *Varying:* Varying duty is a requirement of service that demands operation at loads, and for intervals of time, both of which may be subject to wide variation.

Electric Sign: A fixed or portable, self-contained electrically illuminated appliance with words or symbols designed to convey information or attract attention.

Enclosed: Surrounded by a case which will prevent accidental contact with live parts by a person.

Equipment: A general term including material, fittings, devices, appliances, fixtures, apparatus, and the like, used as a part of, or in connection with, an electrical installation.

Explosion-Proof: Explosion-proof means enclosed in a case which is capable of withstanding an explosion of a specified gas or vapor which may occur within it, and of preventing the ignition of the specified gas or vapor surrounding the enclosure by sparks, flashes or explosions of the specified gas or vapor within.

Exposed: Accessible; not concealed.

Externally Operable: Capable of being operated without exposing the operator to contact with live parts. (This term is applied to equipment, such as a switch, that is enclosed in a case or a cabinet.)

Factory Yard: A plot containing an assemblage of buildings served by an isolated plant, or by a substation, or by a master service, and permitting access from building to building within the yard.

Feeder: Any conductors of a wiring system between the service equipment, or the generator switchboard of an isolated plant, and the branch circuit overcurrent device.

Fitting: An accessory such as a locknut, bushing or other part of a wiring system which is intended primarily to perform a mechanical rather than an electrical function.

General-Use Switch: A switch intended for use as a switch in general distribution and branch circuits. It is rated in amperes and is capable of interrupting its rated current at its rated voltage.

Grounding Conductor: A conductor which is used to connect the equipment or wiring system with a grounding electrode or electrodes.

Guarded: Covered, shielded, fenced, enclosed or otherwise protected, by means of suitable covers or casings, barriers, rails or screens, mats or platforms, to remove the liability of dangerous contact or approach by persons or objects to a point of danger.

Hazardous Location: Premises, locations, rooms or portions thereof in which (1) highly flammable gases, flammable volatile liquids, mixtures or other highly flammable substances are manufactured or used or are stored in other than original containers; or (2) where combustible dust or flyings are likely to be present in quantities sufficient to produce an explosive or combustible mixture; or (3) where it is impracticable to prevent such combustible dust from collecting in such quantities on or in motors, lamps or other electrical devices that they are likely to become overheated because normal radiation is prevented; or (4) where easily ignitible fibers or materials producing combustible flyings are handled, manufactured, stored or used.

Hoistway: A hoistway is any shaftway, hatchway, wellhole, or other vertical opening or space in which an elevator or dumbwaiter is designed to operate.

Isolated: Not readily accessible to persons unless special means for access are used.

Isolated Plant: A private electrical installation deriving energy from its own generator driven by a prime mover.

Isolating Switch: A switch intended for isolating a circuit from its source of power. It is to be operated only when the circuit has been opened by some other means.

Lighting Outlet: An outlet intended for the direct connection of a lampholder, a lighting fixture or a pendent cord terminating in a lampholder.

Location:

Dry Locations: A location not normally subject to dampness or wetness. A location classified as dry may be temporarily subject to dampness or wetness, as in the case of a building under construction.

Damp Location: A location subject to a moderate degree of moisture, such as some basements, some barns, some cold storage warehouses, and the like.

Wet Location: A location subject to saturation with water or other liquids, such as locations exposed to the weather, wash rooms in garages, and like locations. Installations underground or in concrete slabs or masonry in direct contact with the earth, shall be considered as wet locations.

Master Service: The service conductors and service equipment supplying a group of buildings under one management.

Motion-Picture Studio: Any building or portion of a building in which motion-picture films are developed, printed, rewound, repaired, stored or otherwise exposed.

Motor-Circuit Switch: A switch intended for use in a motor-branch-circuit. It is rated in horsepower and is capable of interrupting the maximum operating overload current of a motor of the same horsepower rating at the rated voltage.

Multi-Outlet Assembly: A type of surface metal raceway, designed to hold conductors and plug receptacles, assembled in the field or at the factory.

Outlet: A point on the wiring system at which current is taken to supply fixtures, lamps, heaters, motors and current-consuming equipment generally.

Outline Lighting: An arrangement of incandescent lamps or gaseous tubes to outline and call attention to certain features such as the shape of a building or the decoration of a window.

Panelboard: A single panel or a group of panel units designed for assembly in the form of a single panel; including buses and with or without switches or automatic overcurrent protective devices for the control of light, heat, or power circuits of small capacity; designed to be placed in a cabinet or cutout box placed in or against a wall, or partition and accessible only from the front. (See switchboard.)

Portable Appliance: An appliance capable of being readily moved where established practice or the conditions of use make it necessary or convenient for it to be detached from its source of current by means of flexible cord and attachment plug.

Qualified Person: One familiar with the construction and operation of the apparatus and the hazards involved.

Raceway: Any channel for holding wires, cables or busbars, which is designed expressly for, and used solely for, this purpose. Raceways may be of metal, wood, or insulating material, and the term includes rigid metal conduit, flexible metal conduit, electrical metallic tubing, cellular metal floor raceways, underfloor raceways, surface metal raceways, surface wooden raceways, wireways, busways and auxiliary gutters.

Raintight: So constructed or protected that exposure to a beating rain will not result in the entrance of water.

Rating: (Of fuse) The current rating of a fuse is a designated value of current in amperes marked on the fuse.

Rating: (Of Circuit-breaker) The current rating of a circuit-breaker is the current value in amperes marked on the breaker.

Readily Accessible: Capable of being reached quickly for operation, renewal, or inspection, without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to portable ladders, chairs, or similar objects.

Receptacle Outlet: An outlet equipped with one or more receptacles, not of the screw-shell type, or provided with one or more points of attachment within one foot or less, intended to receive attachment plug caps.

Sealable Equipment: Equipment enclosed in a case or cabinet that is provided with means for sealing or locking so that live parts cannot be made accessible without opening the enclosure. The equipment may or may not be operable without opening the enclosure.

Secondary Neutral Grid: A well grounded network of neutral conductors formed by connecting together within a given area all the neutral conductors of individual transformer secondaries of the supply system.

Service: A service is the conductors and equipment for delivering electrical energy from the secondary distribution or street main, or from a distribution feeder, or from the transformer to the wiring system of the premises served.

Service Cable: Service conductors made up in the form of a cable.

Service Conductors: That portion of the supply conductors which extends from the street main or duct or from transformers to the service equipment of the building supplied. For overhead conductors this includes the conductors from the last line pole to the service equipment.

Service Drop: That portion of overhead service conductors between the pole and the first point of attachment to the building.

Service Entrance Conductors: That portion of service conductors between the terminals of service equipment and a point outside the building, clear of building walls, where joined by tap or splice to the service drop or to street mains or other source of supply.

Service Equipment: The necessary equipment, usually consisting of circuit-breaker or switch and fuses, and their accessories, located near point of entrance of supply conductors to a building and intended to constitute the main control and means of cutoff for the supply to that building.

Service Raceway: The rigid steel conduit or electrical metallic tubing that encloses service entrance conductors.

Setting: As applied to circuit-breakers—the setting of an instantaneous trip circuit-breaker is the current value, in amperes, at which it will trip; the setting of a time-delay circuit-breaker is the value of current, in amperes, which it will carry indefinitely and beyond which it will trip at specified values of overload and time.

Sheet Metal Gauge: Refers to the United States Standard Gauge for sizes of metal sheets.

Show-Window: A show-window is any window used or designed to be used for the displaying of goods or advertising material, whether it is fully or partly enclosed or entirely open at the rear, and whether or not it has a platform raised higher than the street limit.

Special Permission: The written consent of the Buildings Engineer.

Switches: General use, isolating and motor-circuit, see individual paragraphs of this Section.

Switchboard: A large single panel, frame, or assembly of panels, on which are mounted, on the face or back or both, switches, circuit-breakers, overcurrent and other protective devices, buses, and the usual instruments, and accessible from the rear as well as from the front. (See Panelboard.)

System Ground Conductor: An auxiliary, well grounded conductor used for connecting together the individual grounding conductors throughout a given area, but which is not a part of a circuit wire.

Totally Enclosed Motor: A motor which is so completely enclosed by integral or auxiliary covers as to practically prevent the circulation of air through the interior. Such a motor is not necessarily air-tight.

Vaportight: So enclosed that vapor will not enter the enclosure.

Ventilated: Provided with a means to permit circulation of the air sufficiently to remove an excess of heat, fumes or vapors.

Voltage: As applied to a circuit—the greatest effective difference of potential between any two conductors of the circuit concerned.

Voltage to Ground: In grounded circuits, the voltage between the given conductor and that point or conductor of the circuit which is grounded; in ungrounded circuits, the greatest voltage between the given conductor and any other conductor of the circuit.

Waterproof: So constructed or protected that moisture will not interfere with its successful operation.

Watertight: So constructed that moisture will not enter the enclosing case.

Weatherproof: So constructed or protected that exposure to the weather will not interfere with its successful operation.

Wire Gauge: Refers to the American Wire Gauge (Brown and Sharpe Wire Gauge) for sizes of circular conductors.

SECTION 802

INSTALLATIONS PROHIBITED

Circuits Connected to Railway Conductors

Par. 8020. Circuits for lighting and power shall not be connected to any system containing trolley wires with a ground return, except in electric railway cars, car houses, power houses, or passenger and freight stations operated in connection with electric railways.

Constant-Current Systems

Par. 8021. Constant-current systems shall not be installed in or on buildings except as permitted in Paragraph 8702.

SECTION 803

DESIGN OF FEEDERS

General Requirements For Feeders

Par. 8030. The unit values and demand-factors given in this section are based on average load conditions. When, at any time, it is found that the feeder conductors will be, or are, overloaded, they shall be increased in size to comply with the requirements of Paragraph 8050.

Size of Feeder Conductors

Par. 8031. The computed load on a feeder shall be the sum of the loads to be supplied as determined by the provisions of Paragraphs 8034 to 8038, inclusive. The computed load on the neutral feeder shall be subject to the provisions of Paragraph 8032.

Feeder conductors shall be not smaller than is required by Paragraph 8050 for the computed load they carry.

Neutral Feeder Load

Par. 8032. The neutral feeder load shall be the maximum unbalance of the load determined by Paragraph 8031. The maximum unbalanced load shall be the computed load obtained by Paragraph 8031 less all loads tapped from the ungrounded feeders and not connected to the neutral; except that the load thus obtained shall be multiplied by 140 per cent for 5-wire two-phase systems. For 3-wire direct current, or single-phase alternating current, 4-wire three-phase and 5-wire two-phase, a further demand-factor of 70 per cent may be applied to that portion of the unbalanced load in excess of 200 amperes.

Common Neutral Feeders

Par. 8033. A common neutral feeder may be employed only for 2 or 3 sets of 3-wire feeders or for 2 sets of 4-wire or 5-wire feeders.

Computation of Lighting Load

Par. 8034. The feeder load for general lighting shall be the sum of the computed loads as determined for branch circuits in accordance with Par. 8042. The demand factors specified in the following table may be applied to the loads computed for general illumination for the occupancies listed.

TABLE 8034T

Kind of Occupancy	Wattage Based on Area Served	Demand Factor in per cent
Single-apartment Dwelling	2500 or less...........	100
	Excess over 2500......	30
Multi-apart. Dwellings (other than hotels) and apartment houses with provisions for cooking by tenants	3000 or less...........	100
	Excess over first 3000 but not more than 120,000	35
	Excess over 120,000...	25
Hospitals*	50,000 or less.........	40
	Excess over 50,000....	20
Hotels*	20,000 or less.........	50
	Excess over first 20,000 but not more than 100,000	40
	Excess over 100,000...	30
Office Buildings	20,000 or less.........	100
	Excess over 20,000....	70
Schools	15,000 or less.........	100
	Excess over 15,000....	50
Storage Warehouses	12,500 or less..........	100
	Excess over 12,500....	50

* For sub-feeders to areas where the entire lighting is likely to be used at one time, as in ballrooms, dining rooms, operating rooms, etc., a demand factor of 100 per cent shall be used.

Computation of Motor Load

Par. 8035. The motor load shall be considered to be 125 per cent of the full-load current rating of the largest motor in the group plus the sum of the full-load current ratings of the remainder of the motors in the group.

The motor load may be considered less than that just specified where a reduced heating of the feeder conductors results from motors operating on duty-cycle, intermittently, or from all motors not operating at one time, provided the conductors are of sufficient carrying capacity for the maximum load determined by the sizes and number of motors supplied and the character of their loads and duties.

Computation of Small Appliance Load

Par. 8036. The small appliance load required by the provisions of Paragraph 8042 for dwelling occupancies may be included with the lighting load and subject to the demand factors specified for such load.

Computation of Electric Range Load

Par. 8037. The computed load for ranges shall be the sum of the specific loads to be served except that the demand-factors given in the following table may be applied to loads consisting of one or more cooking and baking appliances that are individually rated at more than 1650 watts. These demand-factors are not applicable to appliances other than such cooking or baking appliances.

TABLE 8037T

Number of Ranges	Demand-Factor (Per Cent)	
	Ranges over 1650 watts and under 3500 watts	Ranges 3500 watts & over
1	80	80
2	75	65
3	70	55
4	66	50
5	62	45
6	59	43
7	56	40
8	53	36
9	51	35
10	49	34
11	47	32
12	45	32
13	43	32
14	41	32
15	40	32
16	39	28
17	38	28
18	37	28
19	36	28
20	35	28
21	34	26
22	33	26
23	32	26
24	31	26
25	30	26
26-30	30	24
31-40	30	22
41-50	30	20
51-60	30	18
61 & over	30	16

The demand-factor for one range may also be applied to the conductors of a range branch circuit.

Computation of Other Electrical Load

Par. 8038. The computed load for all appliances shall be the sum of the specific loads to be served, except for lighting, motor, small appliance, and electric range loads as specified in Paragraphs 8034 to 8037, inclusive.

SECTION 804

DESIGN OF BRANCH CIRCUITS

Scope of Branch Circuits

Par. 8040. This Section includes the requirements for branch circuits that supply more than a single lighting or appliance receptacle outlet or that supply a single motor.

General Requirements for Branch Circuits

Par. 8041. Branch Circuits Required: Every lamp, motor, or other appliance, unless supplied by an individual branch circuit, shall be supplied by a branch circuit of one of the types specified in Paragraphs 8044 to 8048, inclusive, or as otherwise required, in other Sections. When motors are connected to any of the circuits described in this Section, the requirements of Section 834 shall also apply.

Voltage: The branch circuits described in this Section except the motor branch circuits of Paragraph 8049, and as permitted for railway properties by Paragraph 8020, shall not exceed 300 volts to ground. Circuits supplying brass shell lampholders and circuits, in dwellings, supplying lampholders of the screw-shell type, receptacles or appliances shall not exceed 150 volts to ground, except that the voltage between conductors supplying permanently connected appliances or portable appliances rated more than 1,650 watts may exceed 150 volts when such portable appliances are connected to receptacles of such design and construction that attachment plugs used on circuits of other voltages cannot be inserted in them.

Division of Load: The total load shall be divided among the branch circuits in proportion to their capacity, in so far as is practicable.

Receptacle Outlets Required: Fixed receptacles shall be installed where portable cords are used, except where the attachment of flexible cords by other means is specifically permitted. Such receptacles shall have a rating of not less than the rating of the load served and, where supplied by circuits of more than 150 volts between conductors, shall be of such design that attachment plugs used on circuits of other voltages cannot be inserted in them. Plug-in connections, or other devices for supplying appliances or lampholders from busways of 20 amperes capacity or less, shall not be interchangeable with such devices for use on busways of larger capacity, unless overcurrent protection rated at not exceeding 15 amperes is provided as an integral part of the plug-in connection or other attachment device.

In every kitchen, dining room, breakfast room, living room, parlor, library, den, sun room, recreation room, and bed room, where receptacle outlets are installed, they shall be so placed along the wall so that no point along such wall will be more than 12 feet from an outlet. At least one receptacle outlet shall be installed in each pantry and adjacent to each set of permanently installed laundry tubs.

The receptacle outlets in the kitchen, the pantry, and adjacent to any laundry tubs, shall be supplied by a special circuit as required by Paragraph 8042.

Rating of Appliances: In determining whether an appliance may be connected to a particular type of circuit, the total rating of the appliance shall be considered, regardless of whether the load is subdivided into two or more units within the appliance.

Heavy-Duty Lampholders: The heavy-duty lampholders referred to in this Section shall include lampholders of the mogul type, lampholders of the medium-base type which are an integral part of a single lighting unit having also a heavy-duty lampholder, and other lampholding devices required for lamps exceeding the maximum rating of the medium-base lamps as permitted in Paragraph 8167.

Classification of Circuits: Branch circuits described in this Section shall be classified in accordance with the maximum permitted rating or setting of the overcurrent device as provided herein. When conductors of larger size than specified are used to provide for voltage drop, the specified rating or setting of the overcurrent device shall determine the circuit classification.

Taps for Outlets: Taps to individual lampholders, or fixtures, and taps not over 18 inches long to individual outlets supplying lampholders or fixtures, may be of smaller size than the branch-circuit conductors, but not less than the size of tap specified for each type of branch circuit, provided the load does not exceed the carrying capacity of the conductor.

Exit Light Circuits: Branch circuits supplying a total of more than 4 exit-sign lights and lights in corridors, stairways, and other required means of egress in all buildings except Public Assembly Buildings, Storage Buildings, and one apartment Dwellings, shall not supply any other outlets and shall not be installed in the same raceways with the general lighting and power circuits.

Determination of Branch Circuits

Par. 8042. The minimum number of branch circuits shall be determined from the total load computed as specified in this Paragraph and the type of circuits to be used, but the number of branch circuits shall, in every case, be sufficient for the specific load to be served. Where circuits supply continuous loads such as store or office lighting and similar loads, the initial load shall not exceed 80 per cent of the branch circuit rating.

General Lighting Load: For general illumination in the occupancies shown in the following table, a load of not less than the "watts per square foot" specified shall be included for each square foot or floor area.

The floor area shall be computed from the outside dimensions of the house, apartment, or area involved, not including open porches, unfinished spaces in basements and attics, and any garage accommodating not more than two cars.

Occupancy	Watts per Square Foot
Apartments and Multi-Family Dwellings. .	2
Armories, Assembly Halls and Auditoriums	1
Banks.	2
Churches.	1
Clubs.	2
Dwellings, Single-Family	2
Garages.	½
Hospitals.	2
Hotels.	2
Industrial Commercial (Loft) Building. . . .	1
Offices.	2
Restaurants.	2
Schools.	3
Storage Warehouses	¼
Stores.	3
In any of these occupancies, except single-family dwellings and individual apartments of multi-family dwellings:	
Hallways, Corridors and Closets.	½
Storage Spaces	¼

In a single-family dwelling with a floor area of 500 square feet or less, the load may be determined as specified in this Paragraph for other occupancies.

Show-Window Lighting: For show-window illumination, a load of not less than 200 watts shall be included for each linear foot of show-window, measured horizontally along its base.

Small Appliance Load: For small appliances, an additional load of not less than 1500 watts shall be included for dining room, kitchen, and laundry purposes in single-family dwellings, in individual apartments of multi-family dwellings having provisions for cooking by tenants, and in each hotel suite having a serving pantry, except that in single-family dwellings with a floor area of less than 1000 square feet, the additional load may be 1000 watts.

A 20-ampere branch circuit shall be installed to supply the receptacle outlets in the kitchen, the pantry, and adjacent to any laundry tubs in dwellings. No other loads shall be supplied from this circuit. Where there is no such circuit in an existing installation, a separate circuit shall be installed for a refrigerator.

Other Loads and Other Occupancies: For other occupancies and for special lighting and appliance loads, the load shall be determined by assuming a load for each outlet of not less than the ampere rating of the appliance for outlets supplying fixed or special appliances, not less than 5 amperes for outlets supplying heavy-duty lampholders, and not less than 1½ amperes for other outlets.

Where fixed multi-outlet assemblies are employed, each 5 feet or fraction thereof of each separate and continuous length shall be considered as one outlet except in locations where a number of appliances are likely to be used simultaneously, when each one foot or fraction thereof shall be considered an outlet.

Busways so designed that loads can be connected at any point shall be limited in length as provided for multi-outlet assemblies except that under conditions of operation where the load will not exceed that permitted for a branch circuit, the Buildings Engineer may permit busways of greater length.

The minimum loads for outlets shall be waived for manual switchboards and switching frames in telephone exchanges.

Existing Installations: When adding new circuits to existing wiring installations, their loads shall be computed as just described. In making extensions to existing branch circuits in dwelling occupancies, the load may be determined by the previously described requirements for other occupancies and shall not exceed the capacity of the circuit.

Common Neutral and Multi-Wire Branch Circuits

Par. 8043. A common grounded neutral conductor may be employed for two or more branch circuits provided not more than 8 ungrounded conductors are used. Such a common neutral conductor shall have a carrying capacity at least sufficient for the current of the maximum unbalanced load. The same number of circuits shall, as nearly as possible, be connected between the neutral conductor and each of the other conductors of the system. When the circuit conductors are installed in conduit or other metal enclosure, all conductors of the group shall be installed in the same conduit or enclosure.

Branch circuits of any of the types recognized in this Section may be installed as multi-wire circuits provided one of the conductors of the circuit is an identified grounded conductor. Conductors of such multi-wire branch circuits shall conform to the following color code: three-wire circuits—one black, one white, one red; four-wire circuits—one black, one white, one red, one blue; five-wire circuits—one black, one white, one red, one blue, one yellow. When two or more multi-wire branch circuits are carried through a single raceway, the ungrounded conductors of the additional circuits may be of colors other than those specified. All circuit conductors of the same color shall be connected to the same ungrounded feeder conductor throughout the installation. For any of the white conductors listed, an uninsulated conductor may be substituted in accordance with the requirements of Paragraph 8313.

Fifteen-Ampere Branch Circuits

Par. 8044. Fifteen-ampere branch circuits shall have conductors not smaller than No. 14 and shall be protected by overcurrent devices having a rating or setting not exceeding fifteen amperes.

Fifteen-ampere branch circuits shall supply only permanently connected lampholders of all types, receptacles rated at not more than fifteen amperes supplying lampholders of the previously specified types or appliances rated at not more than twelve amperes, and fixed appliances with a total rating of not more than six amperes when the circuit also supplies lampholders or portable appliances, twelve amperes when the circuit supplies motor-operated appliances, or fifteen amperes when the circuit supplies only fixed appliances other than motor-operated appliances.

Twenty-Ampere Branch Circuits

Par. 8045. Twenty-ampere branch circuits shall have conductors whose current-carrying capacity is not less than 20 amperes, except that taps meeting the requirements of Paragraph 8041 may be of No. 14, and shall be protected by overcurrent devices having a rating or setting not exceeding 20 amperes.

Twenty-ampere branch circuits shall supply only permanently connected heavy-duty lampholders except that lampholders of the medium-base type may be used when an integral part of a single lighting unit using heavy-duty lampholders, receptacles rated at not less than 15 amperes supplying lampholders of the heavy-duty type or appliances rated at not more than 15 amperes, and fixed appliances with a total rating of not more than 15 amperes when the circuit also supplies lampholders or portable appliances, 15 amperes when the circuit supplies motor-operated appliances, or 20 amperes when the circuit supplies only fixed appliances other than motor-operated appliances.

Twenty-five-Ampere Branch Circuits

Par. 8046. Twenty-five-ampere branch circuits shall have conductors whose current-carrying capacity is not less than 25 amperes, except that taps meeting the requirements of Paragraph 8041 may be of No. 14, and shall be protected by overcurrent devices having a rating or setting not exceeding 25 amperes.

Twenty-five-ampere branch circuits shall supply only permanently connected heavy-duty lampholders except that lampholders of the medium-base type may be used when an integral part of a single lighting unit using heavy-duty lampholders, receptacles rated at not less than 20 amperes supplying lampholders of the heavy-duty type or appliances rated at not more than 20 amperes, and fixed appliances with a total rating of not more than 20 amperes when the circuit also supplies lampholders or portable appliances, 20 amperes when the circuit supplies motor-operated appliances, or 25 amperes when the circuit supplies only fixed appliances other than motor-operated appliances.

Thirty-five-Ampere Branch Circuits

Par. 8047. Thirty-five-ampere branch circuits shall not be used in dwelling occupancies to supply lampholders, nor to supply portable appliances in any occupancy.

Thirty-five-ampere branch circuits shall have conductors whose current-carrying capacity is not less than 35 amperes, except that taps meeting the requirements of Paragraph 8041 may be of No. 14, and shall be protected by overcurrent devices having a rating or setting not exceeding 35 amperes.

Thirty-five-ampere branch circuits shall supply only permanently connected heavy-duty lampholders, except that lampholders of the medium-base type may be used when an integral part of a single lighting unit using heavy-duty lampholders, receptacles rated at not less than 30 amperes supplying lampholders of the heavy-duty type or appliances other than portable, and fixed appliances with a total rating of not more than 25 amperes when the circuit also supplies lampholders, 25 amperes when the circuit supplies motor-operated appliances, or 35 amperes when the circuit supplies only fixed appliances other than motor-operated appliances.

Fifty-Ampere Branch Circuits

Par. 8048. Fifty-ampere branch circuits shall not be used in dwelling occupancies to supply lampholders, nor to supply portable appliances or combination lighting load and appliance load in any occupancy.

Fifty-ampere branch circuits shall have conductors whose current-carrying capacity is not less than 50 amperes, except that taps meeting the requirements of Paragraph 8041 may be of No. 12, and shall be protected by overcurrent devices having a rating or setting not exceeding 50 amperes.

Fifty-ampere branch circuits shall supply only permanently connected heavy-duty lampholders, except that lampholders of the medium-base type may be used when an integral part of a single lighting unit using heavy-duty lampholders, receptacles rated at not less than 50 amperes supplying lampholders of the heavy-duty type or cooking appliances other than portable, and fixed cooking appliances or a fixed range and water heater, with a total rating of not more than 50 amperes. The demand factor for a single range in Table 8037T may be applied to the range load when computing the total rating of a range and water heater.

Motor Branch Circuits and Wound-Rotor Secondary Circuits

Par. 8049. Branch-circuit conductors supplying an individual motor shall have a carrying capacity not less than 125 per cent of the motor full-load current rating except that for motors used for short-time, intermittent, periodic, or varying duty, such conductor shall have a carrying capacity not less than the percentage of the motor name-plate current rating given in the following table, unless the Buildings Engineer grants special permission for conductors of smaller size.

TABLE 8049T1

Classification of Service	Percentages of Name-Plate Current Rating			
	5 Minute Rating	15 Minute Rating	30 & 60 Minute Rating	Continuous Rating
Short-Time Duty— Operating valves, raising or lowering rolls......	110	120	150	...
Intermittent Duty— Freight and passenger elevators, shop cranes, tool heads, pumps, drawbridges, turntables, etc.	85	85	90	140
Periodic Duty— Hoists, rolls, ore and coal-handling machines	85	90	95	140
Varying duty	110	120	150	200

The conductors between stationary motors rated one-third horsepower or less and the separate terminal enclosures permitted in Paragraph 8341 may be smaller than No. 14 but not smaller than No. 18, provided they have current-carrying capacity as required in this Paragraph.

The conductors connecting the secondary of a wound-rotor alternating current motor to its controller shall have a carrying capacity of not less than 125 per cent of the full-load secondary current of the motor when used for continuous duty. For other than continuous duty, these conductors shall have a carrying capacity, in per cent of full-load secondary current, not less than that given in the preceding table. Where the secondary resistor is separate from the controller, the carrying capacity of the conductors between the controller and the resistor shall be not less than that given in the following table:

TABLE 8049T2

Resistor Duty Classification	Carrying Capacity of Wire in Per Cent of Full-Load Secondary Current
Light starting duty	35
Heavy starting duty	45
Extra heavy starting duty	55
Light intermittent duty	65
Medium intermittent duty	75
Heavy intermittent duty	85
Continuous duty	110

SECTION 805

TABLES OF CONDUCTOR AND CONDUIT SIZES

Current-Carrying Capacity of Conductors

Par. 8050. The allowable current-carrying capacities, in amperes, of conductors, based on a room temperature of 30 degrees Centrigrade or 86 degrees Fahrenheit, be in accordance with Table 8050T1 and Table 8050T2.

TABLE 8050T1

NOT MORE THAN THREE CONDUCTORS IN RACEWAY OR CABLE

Size AWG MCM	Rubber Type RW Type R	Synthetic Type SN Type RU Rubber Type RPT Type RP	Rubber Type RHT Type RH	Paper Synthetic Type SNA Asbestos Var-Cam Type AVB Var-Cam Type V	Asbestos Var-Cam Type AVA Type AVL	Impregnated Asbestos Type AI	Asbestos Type A
14	15	18	22	23	28	29	32
12	20	23	27	29	36	38	42
10	25	31	37	38	47	49	54
8	35	41	49	50	60	63	71
6	45	54	65	68	80	85	95
5	52	63	75	78	94	99	110
4	60	72	86	88	107	114	122
3	69	83	99	104	121	131	145
2	80	96	115	118	137	147	163
1	91	110	131	138	161	172	188
0	105	127	151	157	190	202	223
00	120	145	173	184	217	230	249
000	138	166	199	209	243	265	284
0000	160	193	230	237	275	308	340
250	177	213	255	272	315	334	372
300	198	238	285	299	347	380	415
350	216	260	311	325	392	419	462
400	233	281	336	361	418	450	488
500	265	319	382	404	468	498	554
600	293	353	422	453	525	543	612
700	320	385	461	488	562	598	668
750	330	398	475	502	582	621	690
800	340	410	490	514	600	641	720
900	360	434	519	556	...	...	...
1,000	377	455	543	583	681	730	811
1,250	409	493	589	643	...	...	...
1,500	434	522	625	698	784	...	...
1,750	451	544	650	733	...	...	...
2,000	463	558	666	774	839	...	...
CORRECTION FACTOR FOR ROOM TEMPERATURES OVER 30°C.							
C. F.							
40 104	.71	.82	.88	.90	.94	.95	...
45 113	.50	.71	.82	...	...	...	...
50 122	.00	.58	.75	.80	.87	.89	...
55 131	...	.41	.67	...	...	...	...
60 140	...	.00	.58	.67	.79	.83	.97
70 158	...	...	.35	.52	.71	.76	.93
75 167	...	...	.00	...	...	...	...
80 176	...	...	...	.30	.61	.69	.89
90 194	...	...	...	...	.50	.61	.86
100 212	...	...	...	...	...	.51	.82
120 248	...	...	...	...	...	...	.72
140 284	...	...	...	...	...	...	.63

See notes on page 893.

The allowable carrying capacities of No. 18 and No. 16 are 5 and 7 amperes, respectively, when in flexible cords.

The allowable carrying capacities of No. 18 and No. 16 are 10 and 15 amperes, respectively, when in Types AFS, AFSJ, HC, HPD, and HSJ cords for portable heaters.

A bare conductor, in a raceway with insulated conductors, as permitted in Paragraph 8313, shall have the same allowable current-carrying capacity as an insulated conductor of the same size and with the same insulation as the other conductors in the raceway.

If the number of conductors in a raceway or cable is from 4 to 6, the allowable current-carrying capacity of each conductor shall be reduced to 80 per cent of the values in Table 8050T1. If the number of conductors in a raceway or cable is from 7 to 9, the allowable current-carrying capacity of each conductor shall be reduced to 70 per cent of the values in Table 8050T1.

A neutral conductor which carries only the unbalanced current from other conductors shall not be counted in determining the current-carrying capacities of the other conductors in the same conduit or cable with the said neutral conductor.

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TABLE 8050T2

SINGLE CONDUCTOR IN FREE AIR

Size AWG or MCM	Rubber Type R	Rubber Type RP	Rubber Type RHT Type RH	Synthetic Type SNA Asbestos Var-Cam Type AVB Var-Cam Type V	Asbestos Var-Cam Type AVA	Impregnated Asbestos Type AI	Asbestos Type A	Slow-burning Type SB Weatherproof Type W Type SBW
14	20	24	29	30	39	40	43	23
12	26	31	37	40	51	52	57	30
10	35	42	50	54	65	69	75	40
8	48	58	69	71	85	91	100	53
6	65	78	94	99	119	126	134	70
5	76	92	110	115	136	145	158	80
4	87	105	125	133	158	169	180	90
3	101	122	146	155	182	194	211	100
2	118	142	170	179	211	226	241	125
1	136	164	196	211	247	264	280	150
0	160	193	230	245	287	306	325	200
00	185	223	267	284	331	354	372	225
000	215	259	310	330	384	410	429	275
0000	248	298	358	383	446	476	510	325
250	280	338	403	427	495	528	562	350
300	310	373	446	480	555	592	632	400
350	350	421	504	529	612	653	698	450
400	380	457	547	575	665	710	755	500
500	430	517	620	660	765	814	870	600
600	480	577	691	738	857	912	970	680
700	525	632	756	813	942	1003	1065	760
750	545	655	785	846	981	1044	1118	800
800	565	680	815	879	1020	1085	1150	840
900	605	728	872	941	....	....	....	920
1,000	650	782	936	1001	1163	1238	1332	1000
1,250	740	890	1066	1131	....	....	....	....
1,500	815	980	1174	1261	1452	....	....	1360
1,750	890	1070	1282	1370	....	....	....	....
2,000	960	1155	1383	1472	1713	....	....	1670
CORRECTION FACTOR FOR ROOM TEMPERATURES OVER 30° C.								
C. F.								
40 104	.71	.82	.88	.90	.94	.95	...	...
45 113	.50	.71	.82	...	...	...	...	...
50 122	.00	.58	.75	.80	.87	.89	...	...
55 131	...	.41	.67	...	...	...	...	...
60 140	...	.00	.58	.67	.79	.83	.97	...
70 158	...	...	.35	.52	.71	.76	.93	...
75 167	...	...	.00	...	...	...	...	...
80 176	...	...	...	.30	.61	.69	.89	...
90 194	...	...	...	...	.50	.61	.86	...
100 212	...	...	...	...	...	.51	.82	...
120 248	...	...	...	...	...	...	.72	...
140 284	...	...	...	...	...	...	.63	...

The tables in this Paragraph give the allowable continuous current-carrying capacities of copper wires and cables of 98 per cent conductivity. For aluminum conductors the allowable carrying capacities shall be taken as 84 per cent of those given in the tables for the same sizes of copper conductors with the same kind of insulation.

Size of Conduit or Tubing

Par. 8051. The conduit or tubing shall be of such size that the sum of the cross-sectional areas of the individual conductors will be not more than the percentage of the interior cross-sectional area of the conduit or tubing given in the following table, which applies only to complete conduit systems and does not apply to short sections of conduit used to protect exposed wiring from mechanical injury:

TABLE 8051T

PER CENT AREA OF CONDUIT OR TUBING

Type of Conductors	Number of Conductors 1	2	3	4	Over 4
Not lead-covered	53	31	43	40	40
Lead-covered	55	30	40	38	35
For rewiring existing raceways with thinner insulated conductors as provided in Par. 8207.......	60	40	50	50	50

Exceptions:

Where a run of conduit or electrical metallic tubing does not exceed 50 feet in length and does not contain more than the equivalent of two quarter-bends from end to end: three No. 6 stranded conductors may be installed in a one-inch conduit. For services only, three No. 8 insulated conductors may be installed in a three-quarter-inch conduit, two No. 6 insulated and one No. 6 bare conductors or two No. 4 insulated and one No. 4 bare conductors may be installed in one-inch conduit or tubing and two No. 2 insulated and one No. 2 bare conductors in one-and-one-quarter-inch conduit or tubing. A smaller bare conductor may be used in each of these combinations if of suitable current-carrying capacity. Refer to Paragraph 8050.

SECTION 806

TABLES FOR MOTORS AND MOTOR CIRCUITS

Maximum Rating or Setting of Motor-Branch-Circuit Protective Devices

Par. 8060. In motor branch circuits, the ratings or settings, in percentage of the full load, of overcurrent protection devices shall be not more than those shown in Table 8060T1 for motors not marked with a code letter indicating locked-rotor kva or more than those shown in Table 8060T2 for motors marked with a code letter indicating locked-rotor kva.

TABLE 8060T1

Type of Motor	Per Cent of Full-Load Current		
	Fuse Rating	Circuit-Breaker Instantaneous Type	Setting Time Limit Type
Single-phase (all types)......	300	...	250
Squirrel-cage and synchronous (full-voltage, resitor and reactor starting)	300	...	250
Squirrel-cage and synchronous (auto-transformer starting)			
Not more than 30 amperes..	250	...	200
More than 30 amperes......	200	...	200
High-reactance squirrel-cage—			
Not more than 30 amperes..	250	...	250
More than 30 amperes......	200	...	200
Wound-rotor	150	...	150
Direct-current—			
Not more than 50 H. P.....	150	250	150
Not more than 50 H. P.....	150	175	150

TABLE 8060T2

Type of Motor	Per Cent of Full-Load Current		
	Fuse Rating	Circuit-Breaker Instantaneous Type	Setting Time Limit Type
All AC single-phase and polyphase squirrel cage and synchronous motors with full-voltage, resistor or reactor starting:			
Code Letter A	150	...	150
Code Letter B to E	250	...	200
Code Letter F to R	300	...	250
All AC squirrel cage and synchronous motors with auto-transformer starting:			
Code Letter A	150	...	150
Code Letter B to E	200	...	200
Code Letter F to R	250	...	200

For exceptions to the values given in these tables, refer to Paragraphs 8526 and 8527.

CHAPTER 81

CONSTRUCTION OF ELECTRICAL EQUIPMENT AND MATERIALS

Sec. 810—General Requirements for the Construction of Electrical Equipment.
Sec. 811—Electrical Conductors.
Sec. 812—Raceways, Boxes and Fittings, Cabinets and Cutout Boxes.
Sec. 813—Circuit Breakers and Fuses.
Sec. 814—Switchboards and Panelboards.
Sec. 815—Electrical Fixtures.
Sec. 816—Lampholders, Rosettes and Lamps.
Sec. 817—Miscellaneous Electrical Equipment.

SECTION 810

GENERAL REQUIREMENTS FOR THE CONSTRUCTION OF ELECTRICAL EQUIPMENT

Marking Required on Electrical Material and Equipment

Par. 8100. The maker's name, trademark, or other identification symbol shall be placed on all electrical material and equipment. Other markings shall be provided giving voltage, current, wattage, or other ratings as are required elsewhere in this Code.

SECTION 811

ELECTRICAL CONDUCTORS

Marking of Conductors

Par. 8110. Wires, cables and cords of all kinds except weatherproof and paper-insulated wire shall have a continuous distinctive marking so that their maker may be readily identified. All wires, cables and cords shall also be plainly tagged or marked as follows:

The maximum working voltage for which the wire was tested or approved. This may be omitted for slow-burning, weatherproof and asbestos-covered switchboard wires.

The words "National Electrical Code Standard," if they are in accordance with the National Board of Fire Underwriters Standards.

Name of the manufacturing company and, if desired, trade name of the wire.

Month and year when manufactured. This may be omitted for slow-burning and weatherproof wires.

The proper type letter for the particular style of wire or cable as given in the following paragraphs. A type letter or letters used alone indicates a single insulated conductor. The letter L used as a suffix to the other type letters indicates that an outer covering of lead has been applied; D indicates a twin wire with two insulated conductors laid parallel under an outer fibrous covering; M indicates an assembly of two or more insulated conductors twisted together under an outer fibrous covering.

Type letters, when used alone indicate conductors for use at not more than 600 volts. Conductors for use at higher voltages shall be indicated by adding the following numerical suffixes to the type letters:

10—For not more than 1000 volts
20—For not more than 2000 volts
30—For not more than 3000 volts
40—For not more than 4000 volts
50—For not more than 5000 volts

All rubber-covered conductors shall have a readily identifiable permanent marking to indicate the type of insulation.

Conductor Construction

Par. 8111. Insulated conductors for use at 600 volts or less shall conform to the provisions of the following table:

TABLE 8111T1

Trade Name	Type Letter	Maximum Operating Temperature	Insulation	Thickness of Insulation	Outer Covering	Use
Asbestos Synthetic	SNA	90C (194F)	Synthetic and Felted Asbestos	14-8.................. Synthetic......20 Mils Asbestos......20 Mils	Cotton Braid Thickness, 20 Mils	Switchboard Wiring
Varnished Cambric	V	85C (185F)	Varnished Cambric	Same as Type R Except 8...............3/64	Fibrous Covering or Lead Sheath	Dry Locations Only Unless Lead Sheathed. Smaller than No. 6 by Special permission.
Asbestos Varnished Cambric	AVA	110C (230F)	Impregnated Asbestos and Varnished Cambric	14-8 Sol.......45 Mils 6-2 Sol.......65 Mils 1-4/0 Sol.....75 Mils 14-2 Str.......60 Mils 1-4/0 Str.....80 Mils 250-1000 Str..110 Mils	Asbestos Braid Braid.....45 Mils	General Use Dry Locations
Asbestos Varnished Cambric	AVB	90C (194F)	Same as Type AVA	14-8 Sol.......50 Mils 6-4/0 Sol.....80 Mils 14-2 Str.......60 Mils 1-4/0 Str.....80 Mils 250-1000 Str..110 Mils	Flame-Retardant Cotton Braid 14-250....20 Mils 300-1000..26 Mils	General Use Dry Locations
Asbestos Varnished Cambric	AVL	110C (230F)	Same as Type AVA	Solid or Stranded 14-2..........75 Mils 1-4/0........80 Mils 250-1000.....110 Mils	Lead Sheath 14-3......3/64 in. 2-4/0.....4/64 in. 250-500...5/64 in. 550-1000..6/64 in.	General Use Wet Locations
Asbestos	A	200C (392F)	Felted Asbestos	14-8..........40 Mils 6-2..........60 Mils 1-4/0........90 Mils 250-1000.....120 Mils	With or Without Asbestos Braid Braid.....45 Mils	Dry Locations Only. Not for General Conduit Installation. In Raceways, only as Leads to or within apparatus. If without Braid or Moisture-resistant Treatment, Limited to 300 Volts.
Impregnated Asbestos	AI	125C (257F)	Impregnated Felted Asbestos	Same as Type A	With or Without Impregnated Asbestos Braid Braid.....45 Mils	

TABLE 8111T1—Continued

Trade Name	Type Letter	Maximum Operating Temperature	Insulation	Thickness of Insulation	Outer Covering	Use
Code	R	50C (122F)	Code Grade Rubber	14-10............3/64 8-2.............4/64 1-4/0...........5/64 250-500..........6/64 501-1000.........7/64 Over 1000........8/64	Moisture-Resistant Flame-Retardant Fibrous Covering	General Use
Moisture Resistant	RW	50C (122F)	Moisture Resistant Rubber	Same as Type R	Moisture-Resistant Flame-Retardant Fibrous Covering	General Use or in Wet Locations.
Performance	RP	60C (140F)	Performance Grade Rubber	Same as Type R	Moisture-Resistant Flame-Retardant Fibrous Covering	General Use
Heat-Resistant	RH	75C (167F)	Heat-Resistant Grade Rubber	Same as Type R	Moisture-Resistant Flame-Retardant Fibrous Covering	General Use
Small Diameter Building Wire (Heat-Resistant)	RHT	75C (167F)	Heat-Resistant Grade Rubber	14-10............2/64 8...............3/64	Moisture-Resistant Flame-Retardant Fibrous Covering	General Use
Small Diameter Building Wire (Performance)	RPT	60C (140F)	Performance Grade Rubber	14-10...........2/64	Moisture-Resistant Flame-Retardant Fibrous Covering	Rewiring Existing Raceways
Type RU Wire (See Note)	RU	60C (140F)	90 Per Cent Unmilled Grainless Rubber	14-10.........18 Mils	Moisture-Resistant Flame-Retardant Fibrous Covering	Rewiring Existing Raceways
Solid Synthetic	SN	60C (140F)	Solid Flame-Retardant Moisture-Resistant Synthetic Compound	14-10............2/64 8...............3/64 6-2.............4/64 1-4/0...........5/64	None	Rewiring Existing Raceways

TABLE 8111T1—Continued

Trade Name	Type Letter	Maximum Operating Temperature	Insulation	Thickness of Insulation	Outer Covering	Use
Paper		85C (185F)	Paper		Lead Sheath	As Permitted by 2304-b, or by Special Permission
Slow Burning	SB	90C (194F)	3 Braids Impregnated Fire-Retardant Thread	Same as Type V	Outer Cover Finished Smooth and Hard	For Use Only in Dry Locations Where the Room Temperature Exceeds 85C (185F)
Slow Burning Weatherproof	SBW	90C (194F)	2 Layers Impregnated Cotton Thread	Same as Type V	Outer Fire-Retardant Coating	For Use Only in Dry Locations Where the Room Temperature Exceeds 85C (185F)
Weatherproof	WP	80C (176F)	At Least Three Cotton Braids or Equivalent Impregnated			May be used for Interior Wiring Only by Special Permission.

Rubber-covered conductors of the lead-sheathed or multiple-conductor type do not require a flame-retardant, moisture-resistant outer covering over the individual conductors, but all suchconductors shall have a fibrous covering.

Finished conductors of Type RPT and Type RU shall be equivalent mechanically and electrically to Type R conductor.

The thickness of insulation for conductors for use at over 600 volts shall conform to the following tables:

TABLE 8111T2

RUBBER-COVERED WIRES AND CABLES
IN 64ths OF AN INCH

Conductor Size Awg. or 1000 C. M.	Classification				
	R10	R20	R30	R40	R50
14-9	4	5	7	9	10
8	4	5	7	9	10
7-2	5	6	8	9	10
1-4/0	6	7	8	9	10
212-500	7	8	9	10	11
501-1000	8	9	9	10	11
Over 1000	9	9	10	11	12

TABLE 8111T3

VARNISHED CAMBRIC AND FILLER IN SIXTY-FOURTHS OF AN INCH

Single-Conductor Cable

	Conductor Size Awg. or 1000 C. M.	For Voltages Not Exceeding 1000	2000	3000	4000	5000
49	14	4	..	..	..	..
50	12	4	5	..	..	..
51	10	4	5	6	..	..
52	8	4	5	6	7	9
53	7-2	4	5	6	7	9
54	1-3/0	5	6	6	7	9
55	212-500	6	6	7	8	10
56	501-1000	7	7	7	8	10
57	Over 1000	8	8	8	9	10

Multiple-Conductor Cable

	Conductor Size Awg. or 1000 C. M.	For Voltage Not Exceeding 1000		2000		3000		4000		5000	
		C	B	C	B	C	B	C	B	C	B
58	14	4	0	.	.	.	.	.	.	.	.
58a	12	4	0	5	0	.	.	.	.	.	.
58b	10	4	0	5	0	5	2	.	.	.	.
59	8	4	0	5	0	5	2	6	3	6	4
59a	7-2	4	0	5	0	5	2	6	3	6	4
59b	1-4/	5	0	6	0	6	2	6	3	6	4
60	212-500	6	0	6	0	6	2	6	3	7	4
60a	50-1000	6	2	6	2	6	3	6	4	7	4
60b	Over 1000	7	2	7	2	7	3	7	4	7	5

The thickness given in columns headed "C" are for the insulation on the individual conductors. Those given in the columns headed "B" are for the thickness of the overall belt of insulation.

Conductors intended for use as identified conductors of circuits shall be identified as described in Paragraph 8313. Wires having their outer covering finished to show a white or natural gray color but having colored tracer threads in the braid, identifying the source of manufacture, are considered as meeting these requirements.

Armored Cable, Types AC and ACL

Par. 8112. Armored cable shall have distinctive markers throughout its entire length, both in the conductors and in the armor, so that the manufacturer may be readily identified.

The conductors of armored cable shall comply with the requirements for rubber-covered conductors. The individual conductors, except those of lead-covered cable, shall be covered for their entire length with a braid which is both flame-retardant and moisture-resistant.

Armored cable shall be so designed and constructed that the insulating bushing required by Paragraph 8224 can be inserted between the conductors and the armor.

Fixture Wire

Par. 8113. Conductors of fixture wires shall be not smaller than No. 18.

Fixture wires shall be classified as follows:

Type AF asbestos-covered, heat-resisting fixture wire.
Type CF cotton covered, heat-resisting fixture wire.
Type RF-64 rubber-covered fixture wire—1/64 inch insulation —solid or stranded.
Type RF-32 rubber-covered fixture wire—1/32 inch insulation —solid or stranded.
Type RF rubber-covered fixture wire—3/64 inch insulation—solid or stranded.
Type FF-64 rubber-covered fixture wire—1/64 inch insulation —flexible stranding.
Type FF-32 rubber-covered fixture wire—1/32 inch insulation —flexible stranding.
Type FF rubber-covered fixture wire—3/64 inch insulation—flexible stranding.

Type AF fixture wire shall have an approved asbestos covering with or without outer braid.

The covering of type CF fixture wire shall consist of cotton or of other fibrous material, all in the interstices of which shall be filled with material having fire-resistant and insulating properties. Its surface shall be finished smooth and hard. Outer coverings of braided cotton or silk may be provided.

The rubber covering of Types RF-64, RF-32, FF-64 and FF-32 fixture wire shall consist of properly applied and properly vulcanized rubber compound. The thickness of this rubber covering shall be not less than 1/64 inch for No. 18 wire, and not less than 1/32 inch for No. 16 wire, and not less than 3/64 inch for No. 14 wire. Coverings shall be of approved material, and shall be sufficiently tenacious to withstand abrasion when being pulled into fixtures.

Flexible Cords

Par. 8114. All National Electrical Code Standard flexible cords shall be examined and tested at the factory and, if approved, shall be labeled before shipment.

The individual conductors of all cords except those of heat-resistant cords (Types AFC, AFPO, AFPD, AFS, AFSJ, AVPO, AVPD, CFC, CFPO, and CFPD) shall have a rubber covering which shall be vulcanized except for asbestos-covered tinsel cord (Types AT and ATJ) and heater cord (Types HC, HSJ, and HPD). In Type S cord, one conductor intended for use as a grounding conductor may be without individual insulation.

The thickness of the rubber covering shall be not less than 1/64 inch for Types AT, ATJ, CT, CTJ, P-64, PO-64, POSJ-64, PWP-64, HC, HSJ, and HPD. For other types the nominal thickness of the rubber covering shall be as given in the following table:

Wire Size, Awg.	Thickness, Inch
18 and 16	1/32
14 to 10	3/64
8	1/16

One conductor of flexible cords shall have a continuous identifying marker readily distinguishing it from the other conductors. This marker shall consist of either (1) a braid finished to show a white or natural gray color, the braid on the other conductor or conductors being finished to show a readily distinguishable solid color or colors; or (2) a tracer in the braid of any color contrasting with that of the braid and no tracer in the braid of the other conductor or conductors; or (3) in the case of cords having no individual braids (except cords which have insulation on the individual conductors integral with the jacket), the insulation of one conductor shall be of a white or natural gray color and the insulation of the other conductor or conductors shall be of a readily distinguishable color or colors. No tracer thread shall be used in the braid of any conductor of a flexible cord which contains a conductor having a braid finished to show white or natural gray, except that in the case of Types C, PD, and PO cords having the braid on the individual conductors finished to show white or natural gray, the identifying marker may consist of a tracer of any color in the braid of one conductor. Cords having insulation on the individual conductors integral with the jacket (Types POSJ-64 and POSJ-32) shall have a white or natural gray separator on one conductor and a separator of a readily distinguishable solid color on the other conductor. A conductor intended to be used as a grounding conductor when insulated shall have a green finish and the finish of other conductors in the cord shall be of a readily distinguishable contrasting color or colors.

Flexible cords shall conform to the descriptions of the various types given in Table 8114T.

Notes to Table 8114*T*

1. Except for types AFPO, CFPO, PO-64, PO-32, PO, POSJ-64 and POSJ-32 individual conductors shall be twisted together.

2. Type PO-64 is for use only with portable lamps, portable radio receiving appliances, portable clocks and similar appliances which are not liable to be moved frequently and where appearance is a consideration.

3. Types AT, CT, ATJ and CTJ are for use only in lengths not exceeding 8 feet when attached directly, or by means of a special type of plug, to a portable appliance rated at 50 watts or less and shall be used where extreme flexibility of the cord is essential. Types AT and ATJ are for use only with heating appliances.

4. Type K is suitable for use on theater stages.

5. Rubber-filled or varnished cambric tapes may be substituted for the inner braids.

6. Type S is suitable for use on theater stages, in garages and elsewhere, where flexible cords having rubber insulation are permitted by this Code.

7. Type E may have a composite assembly of steel and copper strands in the make-up of the conductors.

Non-Metallic Sheathed Cable

Par. 8119. Non-metallic sheathed cable shall have a continuous distinctive marking so that the maker may be readily identified.

The conductors of non-metallic sheathed cable shall comply with the requirements for rubber-covered conductors, except that no braid need be provided directly over the rubber covering.

Non-metallic sheathed cable shall be approved type, in sizes Nos. 14 to 4, and in addition to the insulated conductors may have an approved size of uninsulated copper conductor for grounding purposes only.

TABLE 8114T

Use			Trade Name	Type	Braid on Each Conductor	Filler	Outer Covering	
							Kind	Number
Attached to a Device	Dry Places	Not Subject to Hard Usage	Asbestos Covered Tinsel Cord	AT[3]	Cotton	None	None	None
					None	None	Cotton or Rayon	1
			Cotton Covered Tinsel Cord	CT[3]	Cotton	None	Cotton or Rayon	1 or None
	Damp Places		Rubber Jacketed Tinsel Cord	ATJ[3]	None	None	Rubber	1
				CTJ[3]	Cotton			
Pendant	Dry Places		Asbestos Covered Heat-Resistant Cord	AFC	Cotton or Rayon	None	None	None
				AFPO	None	None	Cotton, Rayon or Saturated Asbestos	1
				AFPD				
			Cotton Covered Heat-Resistant Cord	CFC	Cotton or Rayon	None	None	None
				CFPO	None	None	Cotton or Rayon	1
See Note 2				CFPD				
Pendant or Portable			Parallel Cord	PO-64	Cotton	None	Cotton or Rayon	1
				PO-32				
				PO				
	Damp Places		All Rubber Parallel Cord	POSJ-64	None	None	Rubber	1
				POSJ-32				
	Dry Places		Lamp Cord	C	Cotton	None	None	None
		Hard Usage	Armored Cord	CA	Cotton	None	Metal Armor	1
		Not Subject to Hard Usage	Twisted Portable Cord	PD	Cotton	None	Cotton or Rayon	1
		Hard Usage	Reinforced Cord	P-64	Cotton	Rubber	Cotton	1
				P-32				
				P				

TABLE 8114T—Continued

Pendant or Portable	Damp Places	Not Subject to Hard Usage	Moisture-Proof Reinforced Cord	PWP64 PWP32 PWP	Cotton	Rubber	Cotton Moisture Resistant Finish	1
		Hard Usage	Braided Heavy Duty Cord	K[4]	Cotton	Jute, Cotton, Sisal, Hemp, Twisted Paper	Cotton-Moisture-Resistant Finish	2[5]
			Vacuum Cleaner Cord	SV	None	None	Rubber	1
			Jun'r Hard Service Cord	SJ				
				SJO			Oil-Resistant Compound	
		Extra Hard Usage	Hard Service Cord	S[6]			Rubber	
				SO			Oil-Resistant Compound	
Portable	Dry Places	Portable Heaters	Rubber Jacketed Heat-Resistant Cord	AFS AFSJ	None	None	Rubber	1
			Heater Cord	HC	Cotton	None	None	None
				HPD	None	None	Cotton or Rayon	1
			Rubber Jacketed Heater Cord	HSJ	None	None	Cotton and Rubber	1
Pendant or Portable	Damp Places	Not Subject to Hard Usage	Heat and Moisture Resistant Cord	AVPD AVPO	None	None	Saturated Asbestos	1
Elevator Lighting and Control			Elevator Cable	E[7]	Cotton	Rubber	Cotton-Flame-Retardant Moisture-Resistant Finish	1
						None	Cotton-Outer One Flame-Retardant, Moisture Resistant	3[5]

See notes on page 907

SECTION 812

ELECTRICAL RACEWAYS, BOXES AND FITTINGS, CABINETS AND CUTOUT BOXES

General Requirements for Electrical Raceways and Cabinets

Par. 8120. Raceways, boxes and fittings, and cabinets and cutout boxes, and appurtenant equipment, unless made of corrosion-resistant material, shall be suitably protected against corrosion both inside and outside, except the threads of joints, by an approved coating of corrosion-resistant material such as zinc, cadmium or enamel. Ferrous raceways and fittings protected from corrosion solely by enamel shall be used only indoors and in occupancies not subject to severe corrosive influences.

Rigid Metal Conduit

Par. 8121. Each standard length of conduit shall be reamed and threaded on each end.

Each standard length of conduit shall bear suitable identifying markings so as to readily distinguish it from ordinary pipe used for other than electrical purposes.

Electrical Metallic Tubing

Par. 8122. Electrical metallic tubing, and elbows and bends for use with tubing shall have a circular cross-section, and shall have such a finish or treatment of outer surfaces or identifying markings to readily distinguish it from rigid metal conduit.

Surface Metal Raceways

Par. 8123. Metal raceways and their elbows, couplings and similar fittings shall be so designed that the sections can be electrically and mechanically coupled together, while protecting the wires from abrasion. Holes for screws or bolts inside the raceway shall be so designed that when screws or bolts are in place their heads will be flush with the metal surface.

Surface Wooden Raceways

Par. 8124. Wooden raceways shall be coated externally and internally, with two layers of waterproofing, or shall be impregnated with a moisture-repellant. The raceway shall be composed of two parts, a backing and a capping, and shall afford suitable protection against abrasion of wires. It shall be so constructed as to thoroughly encase the wire, having a barrier of not less than one-half inch in thickness between wires, and having exterior walls which under grooves shall be not less than three-eighths inch in thickness and on sides not less than one-fourth inch in thickness.

Construction of Auxiliary Electrical Gutters

Par. 8125. Auxiliary electrical gutters shall be of substantial construction and shall provide a complete enclosure for the contained conductors. All surfaces, both interior and exterior, shall be suitably protected from corrosion. Corner joints shall be made tight and where the assembly is held together by rivets or bolts, these shall be spaced not more than 12 inches apart.

Gutters shall be constructed of sheet metal of thicknesses not less than in the following table:

Maximum Width of the Widest Surface of Gutters	Thickness (U. S. Standard Sheet Steel Gauge)
Up to and including 6 inches—No. 16	0.0598 inch
Over 6 inches and not over 18 inches—No. 14	0.0747 inch
Over 18 inches and not over 30 inches—No. 12	0.1046 inch
Over 30 inches—No. 10	0.1345 inch

The current carried continuously in bare conductors in auxiliary gutters shall not exceed 1000 amperes per square inch of cross-section of the conductor.

Bare conductors shall be securely and rigidly supported so that the minimum clearance between bare current-carrying metal parts of opposite polarities mounted on the same surface shall be not less than 2 inches, nor less than one inch for parts that are held free in the air. A spacing not less than one inch shall be secured between bare current-carrying metal parts and any metal surface. Adequate provision shall be made for expansion and contraction of copper bars.

Electrical Boxes and Fittings

Par. 8126. For electrical boxes and fittings, not over 100 cubic inches in size, if constructed of sheet steel, the metal shall not be less than No. 14 U. S. Standard Gauge (0.078 inches) in thickness, or if of cast metal shall have a wall thickness of not less than one-eighth inch, except that if of malleable iron, they shall have a wall thickness of not less than three-thirty-seconds of an inch.

Boxes of over 100 cubic inches in size shall be composed of metal and shall conform to the requirements for cabinets and cutout boxes (Paragraph 8127) except that the covers may consist of single flat sheets secured to the box proper by screws, or bolts instead of hinges. Boxes having covers of this form are for use only for enclosing joints in conductors or to facilitate the drawing in of wires and cables. They are not intended to enclose switches, cutouts or other control devices.

Covers of boxes and fittings shall be of a thickness at least that specified for the walls of boxes of the same material as that used for the cover and of the size under consideration, or shall be lined with firmly attached insulating material not less than one-thirty-second of an inch in thickness. Covers of porcelain or other approved insulating material may be used if of such form and thickness as to afford the requisite protection and strength.

Covers of outlet boxes and outlet fittings having holes through which flexible cord pendants may pass, shall be provided with approved bushings or shall have smooth, well-rounded surfaces, upon which the cord may bear. If conductors other than flexible cord pass through a metal cover, there shall be provided a separate hole for each wire, said hole being equipped with a bushing of suitable insulating material.

Provisions for supports, or other mounting means, for non-metallic boxes, shall be outside of the box, or the box shall be so constructed as to prevent contact between the conductors in the box and the supporting screws.

Electrical Cabinets and Cutout Boxes

Par. 8127. The design and construction of cabinets and cutout boxes shall be such as to secure ample strength and rigidity. If constructed of sheet steel, the metal shall be of not less than No. 16 U. S. Standard Gauge (0.063 inch) in thickness.

Composition cabinets shall be submitted to the Buildings Engineer, for approval.

The spacing within cabinets and cutout boxes shall be sufficient to provide ample room for the distribution of wires and cables placed in them and for a separation between metal parts of devices and apparatus mounted within them as follows:

Base: There shall be an air-space of at least one-sixteenth inch, except at points of support, between the base of the device and the wall of any metal cabinet or cutout box, on which the device is mounted.

Doors: There shall be an air space of at least one inch between any live metal part (including live metal parts of enclosed fuses) and the door, unless the door is lined with an approved insulating material or is of a metal not less that No. 12 U. S. Standard Gauge (0.109 inch), when the air space shall be not less than one-half inch.

Link Fuses: There shall be a space of at least 2 inches between open link fuses and metal-lined walls or metal, metal-lined or glass-paneled doors.

Live Parts: Except as noted above, there shall be an air space of at least one-half inch between the walls, back, gutter partition, if of metal, or door of any cabinet or cutout box and the nearest exposed current-carrying part of devices mounted within the cabinet if the potentials do not exceed 250 volts. This spacing shall be increased to at least one inch if the potentials exceed 250 volts.

Cabinets and cutout boxes shall be deep enough to allow of the closing of the doors when 30-ampere branch-circuit panel board switches are in any position, or when combination cutout switches are in any position, or when other single-throw switches are opened as far as their construction will permit.

Side wiring spaces, side gutters or side wiring compartments of cabinets and cutout boxes shall be rendered tight enclosures by means of covers, barriers or partitions extending from the bases of the devices, contained in the cabinet, to the door, frame, or sides of the cabinet; provided, however, that where the enclosure contains only those conductors which are led from the cabinet at points directly opposite their terminal connections to devices within the cabinet, such covers, barriers or partitions may be omitted. Partially enclosed back wiring spaces shall be provided with covers to complete enclosure. Wiring spaces that are required by Paragraph 8282 and which are exposed when doors are open, shall be provided with covers to complete the enclosure.

Cellular Metal Floor Raceways

Par. 8128. Cellular metal floor raceways shall be so constructed that adequate electrical and mechanical continuity of the complete system will be secured. They shall provide a complete enclosure for the conductors. The interior surfaces shall be free from burrs and sharp edges, and surfaces over which conductors are drawn shall be smooth. Suitable bushings or fittings having smooth, rounded edges shall be provided where conductors pass.

SECTION 813

CIRCUIT-BREAKERS AND FUSES

Circuit-Breakers

Par. 8130. Circuit-breakers shall be manually operable.

Circuit-breakers shall be arranged and mounted so that their operation will not injure the operator.

Circuit-breakers shall indicate whether they are in the open or closed position.

Air circuit-breakers used for the branch circuits described in Section 804 shall be of such design that any alteration of its trip point (calibration) or in the time required for its operation, will be difficult.

Circuit-breakers shall be marked with their rating in such a manner that the marking will be visible after installation.

Cartridge Fuses and Fuseholders

Par. 8131. Cartridge fuses and fuseholders shall be classified according to current and voltage as follows:

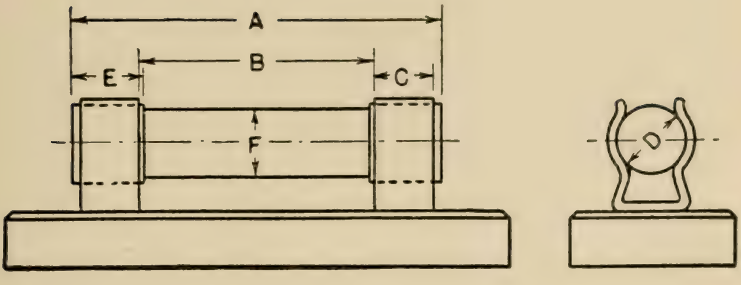
Not over 250 Volts Amperes	Not over 600 Volts Amperes
0-30	0-30
31-60	31-60
61-100	61-100
101-200	101-200
201-400	201-400
401-600	401-600

Cartridge fuses and fuseholders shall be so designed that it will be impossible to put a fuse of any given class into a fuseholder which is designed for a current lower, or voltage higher, than that of the class to which it belongs.

The terminals of cartridge fuses and fuseholders shall be of the ferrule type for ratings of 0-60 amperes, and of the knife-blade type for ratings of 61-600 amperes.

Cartridge fuses and fuseholders shall conform to the dimensions contained in the following table:

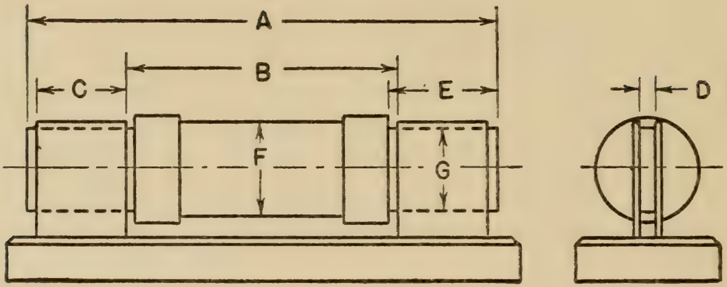
TABLE 8131T



Form 1. CARTRIDGE FUSE—Ferrule Contact.

Voltage	Rated Capacity Amperes		A Length Over Terminals Inches	B Distance between Contact Clips Inches	C Width of Contact Clips Inches
Not over 250	0-30 31-60	Form 1	2 3	1 1¾	½ ⅝
	61-100 101-200 201-400 401-600	Form 2	5⅞ 7⅛ 8⅝ 10⅜	4 4½ 5 6	⅞ 1¼ 1¾ 2⅛
Not over 600	0-30 31-60	Form 1	5 5½	4 4¼	½ ⅝
	61-100 101-200 201-400 401-600	Form 2	7⅞ 9⅝ 11⅝ 13⅜	6 7 8 9	⅞ 1¼ 1¾ 2⅛

TABLE 8131T—Continued



Form 2. CARTRIDGE FUSE—Knife Blade Contact.

D	E	F	G		
Diameter of Ferrules or Thickness of Terminal Blades Inches	Min. Length of Ferrules or of Terminal Blades outside of Tube Inches	Diam. of Tube Inches	Width of Terminal Blades Inches		Rated Capacity Amperes
9/16	½	½		Form 1	0-30
13/16	⅝	¾			31-60
⅛	1	1	¾	Form 2	61-100
3/16	1⅜	1½	1⅛		101-200
¼	1⅞	2	1⅝		201-400
¼	2¼	2½	2		401-600
13/16	½	¾		Form 1	0-30
1 1/16	⅝	1			31-60
⅛	1	1¼	¾	Form 2	61-100
3/16	1⅜	1¾	1⅛		101-200
¼	1⅞	2½	1⅝		201-400
¼	2¼	3	2		401-600

Each cartridge fuse shall be marked with its ampere and voltage ratings. On ferrule-type fuses the ampere rating shall be marked on the tubes or ferrules, and on knife-blade type fuses on the tubes or caps. In addition to the ampere rating mark, each fuse shall be provided with a paper label which shall show the name or trade-mark of the maker and the voltage for which the fuse is designed. All labels for 600 volt fuses shall be red; labels for 250 volt fuses of 15 amperes or less rating shall be navy blue; and labels for 250 volt fuses of rating exceeding 15 amperes shall be green.

Link Fuses and Fuseholders

Par. 8132. Link fuses and fuseholders shall be used only in sizes rated at 600 amperes or more, and then only by special permission.

Link fuses shall be mounted on approved fuseholders.

Link fuses and fuseholders shall have the minimum separation and break distance as contained in the following table:

TABLE 8132T

Amperes Capacity	Minimum Separation of Nearest Metal Parts of Opposite Polarity	Minimum Break Distance
Not over 125 Volts—600-1500	1½ inches	1½ inches
Not over 250 Volts—600-1500	2¾ inches	2 inches

For three-wire systems, link fuses and fuseholders shall have the break distance required for circuits of the potential of the outside wires, except that in 125/250 volt systems with grounded neutral, the fuses and fuseholders in two-wire, 125 volt branch circuits may have the separation required for not over 125 volts.

Link fuses shall be stamped with 80 per cent of the maximum current which they can carry indefinitely.

Contact surfaces or tops of link fuses shall be of copper or aluminum having good electrical connections with the fusible part of the link.

Plug Fuses and Fuseholders

Par. 8133. All plug fuses and fuseholders shall be rated at not more than 125 volts and not more than 30 amperes. Each plug fuse shall be marked with its ampere rating.

Plug fuses of 15-ampere rating or less shall be distinguished from those of larger rating by an hexagonal window in the cap, by a cap or top having an hexagonal shape, or by a cap or top having an hexagonal recess or projection.

Holders for plug fuses shall be Type S or shall be made to hold only Type S fuses by the insertion of an adapter which shall be so constructed that when once inserted in a fuseholder it cannot be removed, except that adapters without the locking device may be used in existing installations.

Type S plug fuses rated at more than 15 amperes shall not be usable with fuseholders or adapters rated at 15 amperes or less.

Type S plug fuses, fuseholders and adapters shall be so constructed as to be shunted only with difficulty. They shall also be so constructed that, when fully assembled, no live parts will be exposed to contact.

SECTION 814

SWITCHBOARDS AND PANELBOARDS

Switchboard Bases

Par. 8140. The panels of switchboards shall be made of moisture-resistant incombustible material.

Switchboard Busbars

Par. 8141. Bare metal busbars shall be rigidly mounted and supported.

Component Parts of Switchboards

Par. 8142. Switches, fuses and fuseholders used on panelboards shall conform to the applicable requirements of Sections 813 and 833.

Panelboard Branch-Circuit Switches

Par. 8143. Branch-circuit switches shall be so arranged that the blades, if exposed during operation, will be dead when the switches are open.

When switchboards or panelboards are provided with color markings to indicate the main bus-bars to which branch-circuit bus-bars are connected, the colors shall conform to the color coding of Paragraph 8043.

Spacing Between Live Parts On Panelboards

Par. 8144. The following minimum distances shall be maintained between bare live metal parts except at switches and circuit-breakers:

TABLE 8144T

	When Mounted On Same Surface	When Held Free In Air	Live Parts To Ground
Not over 125 volts......	¾ inch	½ inch	½ inch
Not over 250 volts......	1¼ inches	¾ inch	½ inch
Not over 600 volts......	2 inches	1 inch	1 inch

At switches, enclosed fuses and similar equipment, parts of the same polarity may be placed as close together as convenience in handling will allow, unless close proximity will cause heating.

SECTION 815

ELECTRICAL FIXTURES

General Construction of Electrical Fixtures

Par. 8150. Electrical fixtures shall be constructed of metal, wood or other approved material, and shall be so designed and assembled as to secure the requisite mechanical strength and rigidity.

Fixture wireways, including entrances thereto, shall be such that conductors can be drawn in and withdrawn without injury.

Electrical Fixtures of Material Other Than Metal

Par. 8151. In all electrical fixtures not made entirely of metal, wireways shall be lined with metal unless approved armoured or lead-covered conductors with suitable fittings are used. This requirement shall not apply to portable table or floor lamps, nor to wireways in glass, marble, or similar nonabsorptive insulating materials.

Mechanical Strength of Electrical Fixtures

Par. 8152. Tubing used for arms and stems on electrical fixtures, where provided with cut threads, shall be not less than 0.040 inch in thickness, and when provided with rolled (pressed) threads shall be not less than 0.025 inch in thickness.

Arms and other parts shall be fastened to prevent turning.

Canopies, if of metal, shall be not less than 0.020 inch in thickness when supporting lampholders, shades, etc., exceeding eight pounds in weight or when incorporating attachment plug receptacles. Other canopies shall be not less than 0.016 inch when made of steel and not less than 0.020 inch when of other metals. Pull type canopy switches shall not be inserted in the rims of metal canopies which are less than 0.025 inch in thickness unless the rims are reinforced by the turning of a bead or the equivalent. Pull type canopy switches, whether mounted in the rims or elsewhere in sheet metal canopies, shall be located not more than 3½ inches from the center of the canopy.

Double set screws, double canopy rings, a screw ring, or equal method shall be used where the canopy supports a pull type switch or pendant receptacle.

Wiring Space In Electrical Fixtures

Par. 8153. Bodies of electrical fixtures, including portables, shall provide ample space for splices and taps and for the installation of devices, if any.

Electrical Fixture Studs

Par. 8154. Electrical fixture studs, which are not parts of outlet boxes, hickeys, tripods, and crowfeet, shall be made of steel, and malleable iron, or other approved material.

Cord Bushings For Portable Electrical Fixtures

Par. 8155. Bushing or the equivalent shall be provided where flexible cord enters the base or stem of a portable lamp. The bushing shall be of insulating material unless a jacketed type of cord is used.

Flush and Recessed Fixtures

Par. 8156. Flush and recessed fixtures shall be so constructed that adjacent combustible material will not be subjected to temperatures in excess of 90 degrees Centigrade (194 degrees Fahrenheit). Where enclosures will hold lamps which will produce temperatures in excess of this value, lamp stops shall be provided to prevent the use of excess size lamps.

Enclosures of sheet steel shall be not less than No. 22USS gauge (0.0299 inch) and shall be protected against corrosion by galvanizing, plating, or an equivalent heat-resisting coating. No solder shall be used in the construction of the fixture box.

Lampholders shall be of porcelain. Cements, when used, shall be of the high-heat type.

Conductor insulation shall be of a type suitable for the operating temperature in accordance with the limitations of Paragraph 8207.

SECTION 816

LAMPHOLDERS, ROSETTES AND LAMPS

Classification of Lampholders

Par. 8160. Lampholders shall be classed according to diameters of lamp bases, as Candelabra, Intermediate, Medium, Admedium and Mogul base; having respectively one-half inch, twenty-one thirty-seconds of an inch, one inch, one and one-sixteenth and one and one-half inches nominal sizes with ratings, as specified in the following table:

TABLE 8160T

Class	Nominal Diam.	Ratings—Switched			Ratings—Unswitched		
		Watts	Volts	Max. Amp. at any Voltage	Watts	Volts	Max. Amp. at any Voltage
Candelabra	½ in.	75	125	¾	75	125	1
Intermediate	21/32 in.	75	125	¾	75	250	1
Medium	1 in.	250	250	2½	660	250	6
		660*	250	6	660	600	
Admedium	1-1/16 in.				660	250	
Mogul	1½ in.	750	250		1500	250	
		1500	250		1500	600	

* This rating may be given only to lampholders having a switch mechanism which produces both a quick "make" and a quick "break" action.

Insulation of Metal Lampholders

Par. 8161. The outer metal shell and the cap of lampholders shall be lined with insulating material which shall prevent the shell and cap from becoming a part of the circuit. The lining shall not extend beyond the metal shell more than one-eighth inch, but shall prevent any current-carrying part of the lamp base from being exposed when a lamp is in the lampholding device.

Lead Wires of Weatherproof Lampholders

Par. 8162. Lead wires, furnished as a part of weather-proof lampholders and intended to be exposed after installation, shall be of approved, stranded, rubber-covered conductors, not less than No. 14 gauge, except that for candelabra sockets they may be not smaller than No. 18 gauge, and shall be sealed in place or otherwise made raintight.

Switched Lampholders

Par. 8163. Switched lampholders shall be of such construction that the switching mechanism interrupts the electrical connection to the center contact. The switching mechanism may also interrupt the electrical connection to the screw shell if connection to the center contact is simultaneously interrupted.

Rating of Rosettes

Par. 8164. Rossettes shall be rated at 660 watts, 250 volts, with a maximum current rating of 6 amperes.

Rosettes For Use With Exposed Wiring

Par. 8165. When designed for use with exposed wiring, rosettes shall be provided with bases which shall have at least two holes for supporting screws, shall be high enough to keep the wires and terminals at least one-half inch from the surface wired over, and shall have a porcelain lug under each terminal to prevent the rosette being placed over projections which would reduce the separation to less than one-half inch.

Rosettes For Use With Electrical Boxes or Raceways

Par. 8166. When designed for use with conduit boxes or wire raceways, rosette bases shall be high enough to keep wires and terminals at least three-eights inch from the surface wired over.

Incandescent Lamps

Par. 8167. Incandescent lamps shall not be equipped with medium bases when above 300 watts rating, nor with mogul bases when above 1500 watts. Above 1500 watts special approved bases or other devices shall be used.

Mercury-Vapor Lamps

Par. 8168. Resistors or regulators for mercury-vapor lamps shall be encased in incombustible cases and treated as sources of heat.

SECTION 817

MISCELLANEOUS ELECTRICAL EQUIPMENT

Name-Plates for Electrical Appliances

Par. 8170. Each electric appliance shall be provided with a name-plate, giving the maker's name and the normal rating in volts and amperes, or in volts and watts.

Marking of Electrical Heating Elements

Par. 8171. Individual heating elements which are a part of an electric appliance containing more than one heating element shall each be legibly marked with normal rating in volts and amperes, or in volts and watts.

Portable Immersion Electric Heaters

Par. 8172. Electric heaters of the portable immersion type shall be so constructed and installed that current-carrying parts are effectively insulated from electrical contact with the substance in which immersed. The Buildings Engineer may make exception of special applications of apparatus where suitable precautionary measures are followed.

Motor and Generator Lead Bushings

Par. 8173. Soft-rubber bushings may be used to protect lead wires where they pass through the frame of a motor or generator, but only where they will not be exposed to oils, grease, oily vapors, or other substances having a deleterious effect on rubber.

Motor Starting Auto-Transformers

Par. 8174. Motor starting auto-transformers shall provide an off position, a running position, and at least one starting position. They shall be so designed that they cannot rest in the starting position, or in any position which will render inoperative the overcurrent protective device in the circuit.

Motor Starting Rheostats

Par. 8175. Motor-starting rheostats shall be so designed that the contact arm cannot be left on intermediate segments. The point or plate on which the arm rests when in the starting position shall have no electrical connection with the resistor.

Motor-starting rheostats for direct-current motors shall be equipped with automatic devices which will interrupt the supply before the speed of the motor has fallen to less than one-third its normal value.

Capacitors

Par. 8176. Capacitors shall be provided with incombustible cases and supports.

Resistors and Reactors

Par. 8177. Fixed and movable contacts of resistors and reactors shall be so designed that arcing will be kept at a minimum.

Reactors shall be composed of incombustible materials, and shall be mounted on incombustible bases.

Motor Code Letters

Par. 8178. Code letters marked on motor nameplates to show motor imput with locked rotor shall be in accordance with the following table:

TABLE 8178T

Code Letter	*Kilovolt-Amperes per Horsepower with Locked Rotor*
A	0— 3.14
B	3.15— 3.54
C	3.55— 3.99
D	4.00— 4.49
E	4.50— 4.99
F	5.00— 5.59
G	5.60— 6.29
H	6.30— 7.09
J	7.10— 7.99
K	8.00— 8.99
L	9.00— 9.99
M	10.00—11.19
N	11.20—12.49
P	12.50—13.99
R	14.00—and up

CHAPTER 82

WIRING METHODS

Sec. 820.—General Requirements for the Installation of Conductors and Raceways.
Sec. 821—Rigid and Flexible Metal Conduit and Electrical Metallic Tubing.
Sec. 822—Armored Cable and Non-Metallic Sheathed Cable.
Sec. 823—Wireways, Busways and Auxiliary Gutters.
Sec. 824—Surface Metal Raceways.
Sec. 825—Underfloor Raceways.
Sec. 826—Bare Conductors.
Sec. 827—Open Wiring on Insulators.
Sec. 828—Installation of Boxes, Cabinets and Fittings.
Sec. 829—Miscellaneous Wiring Methods.

SECTION 820

GENERAL REQUIREMENTS FOR THE INSTALLATION OF CONDUCTORS AND RACEWAYS

General Requirements for the Installation of Wiring

Par. 8200. The provisions of this Chapter are not intended to apply to the conductors which form an integral part of equipment such as motors, controllers and the like.

The regulations of Chapter 82 shall apply to all wiring installations with voltages not exceeding 600, except the signal systems of Section 892, and except where specifically limited in a subsequent section.

All unnecessarily complicated wiring shall be avoided where practicable.

General Requirements for the Installation of Electrical Raceways

Par. 8201. Raceways, except those designed for exposed work, which have a removable capping or cover, shall first be installed as a complete raceway system without the conductors. Pull wires, if used, shall not be installed until the raceway system is in place.

Raceways and cable assemblies shall be continuous from outlet to outlet and from fitting to fitting, and shall be mechanically secured to all boxes and fittings. The entire raceway or cable system shall be securely fastened in place.

Interior metal raceways, cable armor, and other metal enclosures for conductors, shall be metallically joined together into a continuous electrical conductor, and shall be so connected to all boxes, fittings and cabinets as to provide effective electrical continuity.

Metal raceways, cable armor and fittings shall be grounded if and as prescribed in Chapter 86.

Special Requirements for the Installation of Electrical Raceways

Par. 8202. If portions of an interior raceway system are exposed to widely different temperatures as in refrigerating or cold storage plants, provision shall be made to prevent circulation of air through the raceway from a warmer to a colder section.

Requirements for Electrical Boxes, Cabinet and Fittings

Par. 8203. An electrical box shall be installed at each outlet, switch, or junction point of conduit, electrical metallic tubing, surface metal raceway, armored cable, rubber or other non-metallic sheathed cable. At every outlet used exclusively for lighting, the box shall be so designed or installed that a fixture may be attached. At least 6 inches of free conductor shall be left at each outlet and switch point for the making up of joints or the connection of fixtures or devices, except where conductors are intended to loop without joints through lampholders, receptacles, and similar devices.

General Requirements for the Installation of Conductors

Par. 8204. Conductors in raceways and cable assemblies shall be continuous from outlet to outlet and except as permitted for auxiliary gutters in Paragraph 8239, and for wireways in Paragraph 8237, there shall be no splice or tap within a raceway proper.

Conductors shall not be installed until all mechanical work on the building which is likely to injure the conductors has been completed, as far as possible.

Cleaning agents or lubricants having a deleterious effect on conductor coverings shall not be used.

Conductors shall be securely fastened in place and where run open shall be held in such a manner as to be rigid.

Conductor Connections

Par. 8205. Conductors shall be so spliced or joined as to be mechanically and electrically secure without solder and, unless made with an approved splicing device, shall then be soldered with a fusible metal or alloy or brazed or welded. The joints and the free ends of conductors shall be covered with an insulation equal to that on the conductors.

Connections of conductors to terminal parts shall be made by the use of such devices or methods as will insure a thoroughly good connection without damaging the conductors. These connections shall be made by means of pressure connectors (including the setscrew type), solder lugs, or splices to flexible loads, except that No. 8 or smaller solid conductors and No. 10 or smaller stranded conductors may be connected by means of clamps or screws with terminal plates having upturned lugs. Terminals for more than one conductor shall be of a type approved for the purpose.

Grounding conductors for interior wiring systems and for service raceways shall be connected to terminals by approved connectors.

Special Requirements for the Installation of Conductors

Par. 8206. Conductors of signal or radio systems shall not occupy the same enclosure with conductors of light or power systems, except as permitted for elevators in Paragraph 8475, for sound systems in Paragraph 8804, and for signal and control systems in Paragraph 8024. Conductors of light and power systems of 600 volts or less may occupy the same enclosure only where all conductors are insulated for the maximum voltage of any conductor within the enclosure. Conductors of light and power systems of over 600 volts shall not occupy the same enclosure with conductors of light and power systems of 600 volts or less.

The secondary conductors of a wound-rotor motor may be installed in the same raceway, fitting, or other enclosure with the conductors supplying power to the motor.

Where the conductors of circuits operating on alternating current are installed in metal raceway or cable armor, or where they enter metal enclosures, they shall be so arranged as to avoid overheating of the metal by induction.

In the case of circuits supplying vacuum or gastube lighting systems or signs, X-ray apparatus, and under-plaster extensions in Paragraph 8290, a single conductor may be placed in a metal raceway or cable armor.

Conductors may be placed in multiple only by special permission of the Buildings Engineer and shall be so designed and installed that the total current will be divided between the paralleled circuits in proportion to their current-carrying capacities. There shall be no taps made between the points of paralleling.

Temperature Limitations of Insulated Conductors

Par. 8207. Insulated conductors shall not be used where the maximum operating temperature will exceed the maximum temperature specified in the table in this Paragraph for the particular insulation. Only conductors with the following types of insulation, and under the limitations given, are approved for use in the wiring methods in this Chapter, except for conductors which are not required to have insulating coverings, where special types of approved wiring material are specified elsewhere in this Code, or where conditions exist which do not permit the use of these types of insulation, such as the presence of fumes which are deleterious to the insulating covering of the conductor, other types of insulation that are suitable may be used by special permission of the Buildings Engineer.

TABLE 8207T

Insulation	Type Letter	Maximum Operating Temperature	Other Limitations
Code grade rubber	R	50C (122F)	General use.
Performance grade rubber	RP	60C (140F)	General use.
Heat-resistant rubber	RH	75C (167F)	General use.
Moisture-resistant rubber	RW	50C (122F)	General use or in wet locations.
Small diameter, building wire, heat-resistant	RHT	75C (167F)	See Note A.
Small diameter, building wire, performance	RPT	60C (140F)	See Note B.
Type RU wire	RU	60C (140F)	See Note B.
Synthetic	SN	60C (140F)	See Note B.
Varnished cambric	V	85C (185F)	Dry locations only unless lead covered. Smaller than No. 6 by special permission.
Asbestos varnished cambric	AVA	110C (230F)	General use. Dry locations.
Asbestos varnished cambric	AVB	90C (194F)	General use. Dry locations.
Asbestos varnished cambric	AVL	110C (230F)	General use. Wet locations.
Asbestos	A	200C (392F)	See Note C.
Impregnated asbestos	AI	125C (257F)	See Note C.
Paper	...	85C (185F)	See Note D.
Slow-burning	SB	90C (194F)	See Note E.
Slow-burning weatherproof	SBW	90C (194F)	See Note E.
Weatherproof	WP	80C (176F)	See Note F.

Note A—Conductors having Type RHT insulation may be used wherever Types R, RP or RH insulations are acceptable.

Note B—In rewiring existing raceways where space is not available for conductors having the insulation thickness of Type R and it is impracticable to increase the size of the raceway due to structural conditions, the following types of conductors may be used: (1) rubber insulation of a grade not lower than Type RP in sizes Nos. 14, 12, and 10 with an approved insulation thickness not less than 1/32 inch, (2) Type RU, (3) Type SN.

Note C—Type A and AI are for use in dry locations only. They are not for general conduit installation and shall be installed in raceways only as leads to or within apparatus. They are limited to circuits not exceeding 300 volts when without outer braid or without moisture-resistant treatment.

Note D—Refer to Paragraph 8322 or may be used by special permission of the Buildings Engineer.

Note E—For use only in dry locations where the room temperature exceeds 85 deg. C (185 deg. F).

Note F—May be used for open wiring in buildings where other insulations are not suitable for existing conditions, only by special permission of the Buildings Engineer.

Conductors subject to corrosive vapors shall be weatherproof (Type WP), varnished cambric (Types V, AVA, AVB, or AVL), asbestos (Types A and AI), rubber covered (Types R, RP, RH, or RW), or such other types as the Buildings Engineer may direct.

Conductors installed underground, in concrete slabs or other masonry in direct contact with earth, in permanently moist locations, or where the condensation and accumulation of moisture within the raceway is likely to occur shall be lead-covered, rubber-covered Type RW, or of other type specially approved for such locations.

Conductors of No. 6 and larger, installed in raceways shall be stranded.

The allowable continuous current-carrying capacity of copper and aluminum wires and cables is given in Paragraph 8050.

Conductors, whether solid or stranded, shall not be of smaller size than No. 14 except as specifically permitted elsewhere in this Code.

Supports for Vertical Conductors

Par. 8208. Conductors in vertical raceways shall be supported at intervals not greater than those specified in the following table:

TABLE 8208T

Conductor Size	Spacing of Supports
No. 1/0 Awg. and smaller.......	100 feet, maximum
No. 4/0 Awg. and smaller.......	80 “ “
350,000 c. m. and smaller.......	60 “ “
500,000 c. m. and smaller.......	50 “ “
750,000 c. m. and smaller.......	40 “ “
Above 750,000 c. m.............	35 “ “

The following methods of supporting cables shall be used:

By approved clamping devices constructed of or employing insulating wedges inserted in the ends of the conduits.

By inserting boxes at the required intervals in which insulating supports are installed and secured in a satisfactory manner to withstand the weight of the conductors attached thereto, the boxes being provided with covers.

In junction boxes, by deflecting the cables not less than 90 degrees and carrying them horizontally to a distance not less than twice the diameter of the cable, the cables being carried on two or more insulating supports, and additionally secured thereto by tie wires if desired.

By other devices or methods approved by the Buildings Engineer.

Insulation Resistance of Circuits

Par. 8209. All wiring shall be so installed that when completed the system will be free from short-circuits and grounds.

SECTION 821

THE USE OF RIGID AND FLEXIBLE METAL CONDUIT AND ELECTRICAL METALLIC TUBING

Locations Where Conduit and Tubing are Permitted

Par. 8210. Rigid and flexible conduit and electrical metallic tubing may be installed in any location with the special restrictions and provisions of this Section, and with the special requirements for Hazardous Locations, in Section 840.

Conditions Where Conduit and Tubing are Prohibited

Par. 8211. Rigid metal conduit or electrical metallic tubing, unless of corrosion-resistant material suitable for the purpose, shall not be imbedded in cinder concrete or used in or under cinder fill where subject to permanent moisture unless protected on all sides by a layer of noncinder concrete at least 2 inches thick or unless the conduit or tubing is at least 18 inches under the fill.

Flexible metal conduit shall not be imbedded in any kind of concrete, except by special permission of the Buildings Engineer.

Conduit or Tubing in Corrosive Atmospheres.

Par. 8212. When conduit or tubing is installed in locations where it is exposed to corrosive fumes or vapors such as exist in some chemical works, metal refineries, glue houses, fertilizer rooms, hide cellars, salt storages, and casing rooms, the conduit, tubing, and fittings shall be made of a corrosion-resisting material suitable for the conditions.

As far as possible, the use of dissimilar metals throughout the system shall be avoided to eliminate the possibility of galvanic action.

Conduit or Tubing Where Moisture is Present

Par. 8213. In portions of dairies, laundries, canneries, and other locations where excessive moisture is continuously or frequently present, and in other locations where walls are frequently washed, the entire conduit or tubing system, including all boxes and fittings used therewith, shall be made watertight.

Where threadless type couplings and connectors are used in wet places or where buried in concrete or other masonry, they shall be of an approved type employing a solid, soft metal, packing ring to insure watertightness.

Conductors used with flexible conduit in wet or damp places shall be covered with a lead sheath.

Special Restrictions on Use of Tubing

Par. 8214. Electrical metallic tubing shall not be used in interior wiring systems of more than 600 volts, for conductors larger than No. 0 Awg., in sizes larger than the 2-inch electrical trade size, where subject to severe mechanical injury, in hoistways, nor in hazardous locations as defined in Section 840.

Number of Conductors Permitted in Conduit or Tubing

Par. 8215. The number and area of conductors contained in any run of rigid or flexible conduit or of electrical metallic tubing shall be in accordance with the tables in Section 805.

Minimum Size Conduit or Tubing Permitted

Par. 8216. No conduit or tubing smaller than ½-inch, electrical trade size shall be used except as provided for under plaster extensions in Paragraph 8290, and for enclosing the leads of fractional horsepower motors as permitted in Paragraph 8341.

Bends in Conduit or Tubing

Par. 8217. Bends and offsets of rigid or flexible metal conduit or electrical metallic tubing shall be so made that the conduit or tubing will not be injured, the circular cross-section will be maintained, and the internal diameter of the conduit will not be reduced at the bend. The radius of the curve of the inner face of any field bend shall be not less than six times the internal diameter of the conduit or tubing, where braid-covered conductors are used, and not less than ten times the internal diameter of the conduit or tubing where lead-covered conductors are used.

A run of conduit or tubing between outlet and outlet, between fitting and fitting, or between outlet and fitting, shall not contain more than the equivalent of four quarter-bends, including those bends located immediately at the outlet or fitting.

Terminating Conduit or Tubing

Par. 8218. Where conduit or tubing enters a box or other fitting, an approved bushing shall be provided to protect the conductor from abrasion, unless the design of the box or fitting is such as to afford equivalent protection.

If a metal raceway system contains any conductor operating at more than 150 volts to ground, the electrical continuity of the system shall be assured by one of the following methods:

Two locknuts, one inside and one outside of boxes and cabinets.

Threaded or threadless fittings with the joints made up tight.

Bonding jumpers complying with the requirements of Paragraph 8649.

Other devices approved for the purpose.

Workmanship on Conduit or Tubing

Par. 8219. All ends of conduit and tubing shall be reamed to remove rough edges.

Threadless type couplings and connectors used with conduit or tubing shall always be made up tight.

SECTION 822

ARMORED CABLE AND NON-METALLIC SHEATHED CABLE

Locations Where Armored Cable and Non-Metallic Sheathed Cable Is Permitted

Par. 8220. Armored cable, types AC and ACL, may be used only for concealed wiring in wooden joist construction of small residences and apartment buildings not over four stories high, in stores located in such residences and buildings, and in garages, accommodating not more than two vehicles.

Non-metallic sheathed cable may be used under similar conditions, but only in the Fourth Fire Zone.

Armored cable may be used also for the wiring of signs and outline lighting in accordance with Paragraph 8904, and for underplaster extensions as provided in Paragraph 8290.

Type of Armored Cable For Damp Locations

Par. 8221. Armored cable shall contain lead-covered conductors (type ACL) if used where exposed to the weather, to continuous moisture, or to oil, gasoline, or other materials having a deteriorating effect on rubber.

General Installation Requirements For Armored Cable and Non-Metallic Sheathed Cable

Par. 8222. Armored cable and non-metallic sheathed cable shall be secured in place at intervals not exceeding 4½ feet and within 12 inches from every outlet box or fitting, except where cable is fished and except lengths of not over 24 inches at terminals where flexibility is necessary. Type ACL used to supply an outdoor sign shall closely follow the surface of the building except immediately adjacent to the sign where flexibility is necessary. Staples, pipe straps, and similar fittings used to support the cable shall be so designed and installed as not to cause injury to the cable.

When armored cable or non-metallic sheathed cable is run through bored holes in studs, joists, or similar wooden members, the holes shall be bored at the approximate centers of the members, but not less than 2 inches from the nearest edge. Where there is no objection because of weakening the building structure, armored cable or non-metallic sheathed cable may be laid in notches in the studding or joists if the cable at those points is protected against the driving of nails into it by having the notch covered with a suitable metal plate before the building finish is applied.

Neither type AC nor type ACL armored cable shall be buried in concrete or other masonry. Non-metallic sheathed cable shall not be embedded in concrete, other masonry fill, or plaster.

Installation of Armored Cables and Non-Metallic Sheathed Cable In Accessible Attics

Par. 8223. Armored cable or non-metallic sheathed cable in accessible attics or roof spaces shall be installed as follows:

If run within 7 feet of the floor or floor joist, across the top of floor joists, or across the face of rafters or studding, the cable shall be protected by substantial guard strips which are at least as high as the cable. If the attic is not accessible by permanent stairs or ladders, protection shall only be required within 6 feet of the nearest edge of scuttle or attic entrance.

Where carried along the sides of rafters, studs or floor joists, neither guard strips, nor running boards are required.

Terminating Armored Cable

Par. 8224. At all points where the armor terminates, a fitting shall be provided to protect wires from abrasion, unless the design of the outlet boxes or fittings is such as to afford equivalent protection, and in addition, an approved insulating bushing or its equivalent shall be provided between the conductors and the armor. The connector or clamp by which the armored cabled is fastened to boxes or cabinets shall be of such design that the insulating bushing or its equivalent will be visible for inspection. This bushing is not required with lead-covered cables which shall be so installed that the lead sheath will be visible for inspection.

If armored cable contains any conductor operating at more than 150 volts to ground, the electrical continuity of the system shall be assured by one of the following methods:

Two locknuts, one inside and one outside of boxes and cabinets.

Threaded or threadless fittings with the joints made up tight.

Bonding jumpers complying with the requirements of Paragraph 8649.

Other devices approved for the purpose.

Bends In Armored Cable

Par. 8225. All bends shall be so made, and other handling shall be such, that the protective coverings of the armored or non-metallic sheathed cable will not be injured, and the radius of the curve of the inner edge of any bend will be not less than 5 times the diameter of the cable.

SECTION 823

WIREWAYS, BUSWAYS AND AUXILIARY GUTTERS

Locations Where Wireways And Busways Are Permitted

Par. 8230. Wireways and busways, used as the wiring method, are permitted only in the following locations:

In Industrial Buildings of all types of construction and in garages as provided in Paragraph 8411.

As risers and feeders in Type A, Fire-proof, and Type B, Fire-resistant, buildings of other occupancies.

Wireways and busways shall be run exposed and in dry locations.

Conditions Where Wireways and Busways Are Prohibited

Par. 8231. Wireways and busways shall not be placed in hoistways, in locations where they will be subject to severe mechanical injury, corrosive vapors, or excessive moisture, nor in hazardous locations as defined in Section 840.

Voltage Limit For Wireways and Busways

Par. 8232. Wireways and busways shall not be used in circuits that operate at more than 600 volts between any two conductors or between any conductor and the ground.

Number and Sizes of Conductors Permitted in Wireways

Par. 8233. Wireways shall not contain more than 30 conductors at any cross section not including any conductors used for signaling circuits or for control purposes between a motor and its starter and used only for starting duty.

The sum of the cross-sectional areas of all contained conductors at any cross section of a wireway shall not exceed 20 percent of the interior cross-section area of the wireways.

No conductor larger than 500,000 c. m. shall be installed in a wireway.

General Installation Requirements For Wireways and Busways

Par. 8234. Wireways and busways shall be securely supported at intervals not exceeding 5 feet, unless specially approved for supports at greater intervals, but in no case shall the distance between supports exceed 10 feet. The covers shall be securely fastened in place.

Suitable bushings, shield, or fittings having smooth rounded edges shall be provided where conductors pass between wireways, busways, and auxiliary gutters, through partitions, around bends, between gutters and cabinets or junction boxes and at other locations where necessary to prevent abrasion of the insulation of the conductors.

Dead ends shall be closed by approved fittings.

Wireways and busways shall enclose conductors only and shall not be used to enclose switches, overcurrent devices, or other appliances or apparatus.

Wireways and busways may extend transversely through walls when they are in unbroken lengths where passing through, and if the walls are dry.

The installation shall be made in such a manner that the manufacturer's name or trade-mark, and, for busways, the voltage and current rating, will be visible after the installation is complete.

Extensions From Wireways and Busways

Par. 8235. Rigid or flexible metal conduits, electrical metallic tubing, surface metal raceways or, for portable appliances, suitable cord assemblies approved for hard usage, shall be used in extensions from wireways or from busways and shall be connected to the wireway or busway in a manner that is approved for the material employed as specified in other sections of this Chapter.

Bonding Requirements For Wireways and Busways

Par. 8236. When grounded, wireways and busways shall be bonded at expansion joints or telescoping sections by bonding jumpers or other approved means of grounding.

Splices Located in Wireways

Par. 8237. Splices or taps, made and insulated by approved methods, may be located within the wireway when they are accessible, by means of removable covers or doors. The conductors, including splices and taps, shall not fill the wireway to more than 75 percent of its area.

Taps from conductors in wireways shall be provided with overcurrent protection in conformity with the requirements of Paragraph 8514.

Branch Circuits From Busways

Par. 8238. Taps from busways shall leave the enclosure opposite their terminal connections and insulated conductors shall not be brought in contact with uninsulated current-carrying parts of opposite polarity.

Plug-in connections or other devices for tapping off branch lines from busways shall be of approved types containing the overcurrent devices required for the branch circuit. When the plug-in device is not readily accessible, the overcurrent device shall be enclosed or guarded until it is disconnected from its supply.

Auxiliary Electrical Gutters Used to Supplement

Par. 8239. Auxiliary gutters may be used only to supplement wiring spaces at meter centers, distribution centers, switchboards and similar points of interior wiring systems.

With the exception of the special requirements of this Paragraph, the installation of auxiliary gutters shall comply with the requirements for the installation of wireways or busways according to whether insulated or bare conductors are installed in the gutter.

They shall not extend more than 30 feet beyond the equipment which they supplement except in elevator work. Any extension beyond this distance shall comply with the requirements for wireways or busways in this Section.

All taps from auxiliary gutters shall be suitably identified at the gutter as to the circuit or equipment which they supply.

No limitation is placed on the maximum size of conductor that may be installed in auxiliary gutters.

No manufacturer's designation or other marking is required on auxiliary gutters.

SECTION 824

SURFACE METAL RACEWAYS

Locations Where Surface Metal Raceways Are Permitted

Par. 8240. Surface metal raceways shall be installed only in dry locations and shall be run exposed.

For the use of surface metal raceways in underplaster extensions, see Paragraph 8290.

Conditions Where Surface Metal Raceways Are Prohibited

Par. 8241. Surface metal raceways shall not be placed in hoistways, nor where they may be subjected to severe mechanical injury, nor where corrosive vapors are present, nor where excessive moisture exists, nor in hazardous locations as defined in Section 840.

Voltage Limits For Surface Metal Raceways

Par. 8242. Surface metal raceways shall not be used in circuits that operate at more than 300 volts between any two conductors or at more than 150 volts between any conductor and the ground, unless the metal has a thickness of not less than 0.04 inch.

Number and Sizes of Conductors Permitted In Surface Metal Raceways

Par. 8243. Surface metal raceways shall not be used for conductors larger than No. 6, nor for a number of conductors greater than that for which the raceway is approved and in no case for more than ten conductors, except as expressly permitted elsewhere in this Code.

General Installation Requirements for Surface Metal Raceways

Par. 8244. Surface metal raceways and their elbows, couplings, and similar fittings, shall be coupled together both mechanically and electrically and shall be securely fastened to the surface wired over.

Surface metal raceways may be extended through dry walls, dry partitions, and dry floors if in unbroken lengths where passing through.

Installation of Surface Metal Raceways for Combination Signal and Power

Par. 8245. When combination metal raceways are used both for signal and for lighting and power circuits, the different systems shall be run in separate compartments, identified by sharply contrasting colors of the interior finish, and the same relative position of compartment shall be maintained throughout the premises, in which case the provisions of Paragraph 8206 shall be considered as having been observed. When such combination metal raceways are used, not more than ten No. 14 conductors shall be permitted in the compartment for light, heat and power circuits. Extension of light and power circuits to and from combination metal raceways shall be in conduit or electrical metallic tubing connected to the raceway with approved fittings. In all other respects, the provisions of this section covering single compartment raceways, shall apply.

SECTION 825

UNDERFLOOR RACEWAYS

Locations Where Underfloor Raceways Are Permitted

Par. 8250. Underfloor raceways may be used only when installed beneath the surface of concrete or other flooring material. Open-bottom type of raceways may be used only in concrete fill between the rough and the finished floor. Raceways laid flush with concrete floors and covered with linoleum not less than ⅛ inch in thickness or equivalent floor covering, may be used only for the signal and control systems of Section 892.

Conditions Where Underfloor Raceways Are Prohibited

Par. 8251. Underfloor raceways shall not be installed in corrosive atmospheres, in garages, nor in hazardous locations as defined in Section 840.

Voltage Limit for Underfloor Raceways

Par. 8252. Underfloor raceways shall not be used in circuits that operate at more than 300 volts between any two conductors or at more than 150 volts between any conductor and the ground.

Number and Sizes of Conductors Permitted in Underfloor Raceways

Par. 8253. Underfloor raceways shall not be used for any conductor larger than No. 4. The combined cross-sectional area of all contained conductors shall not exceed 40 percent of the interior cross-sectional area of the raceway.

General Installation Requirements for Underfloor Raceways

Par. 8254. Underfloor raceways, where practicable, and their fittings, shall be so arranged as to avoid low points that may form traps for water. Where raceways are run at other than right angles, special fittings shall be provided. Dead ends of raceways shall be closed.

Connections between raceways and distribution centers, or wall outlets, shall be by means of rigid or flexible metal conduit, electrical metallic tubing, or fittings specially approved for the purpose.

Installation of Underfloor Raceways in Concrete Construction

Par. 8255. Underfloor raceways of half-round section, or of flat top section of not over 4 inches in width, shall have at least ¾ inch of concrete or wood above the raceway, except that in office occupancies, metal flat top raceways not over 2 inches in width may be laid flush with the concrete if covered with substantial linoleum not less than ⅛ inch in thickness or equivalent floor covering.

Flat-top raceways over 4 inches in width, and flat-top raceways placed less than ½ inch apart, shall be covered with concrete to a depth of at least 1½ inches.

Open bottom types of underfloor raceways shall not be used in floors of monolithic construction.

Special Requirements for the Installation of Open-Bottom Underfloor Raceways

Par. 8256. Open-bottom raceway shall be laid on a smooth pad of concrete extending at least 1 inch on each side of the raceway and at least 1 inch thick, except that this thickness may be reduced to ¼ inch where the raceway crosses a run of conduit, and except that in lieu of a concrete pad, fittings which will protect the conductors from contact with piping, structural steel and other obstructions may be used. Raceways shall be mechanically secured to the concrete pad.

Installation of Inserts in Underfloor Raceways .

Par. 8257. Inserts for outlets and junction boxes in Underfloor Raceways shall be leveled to the floor grade and sealed against the entrance of water. In the case of metal raceways, inserts and junction boxes shall be of metal, electrically continuous with the raceways. Inserts set in or on fiber raceways before the floor is laid shall be mechanically secured to the raceway. Inserts set in fiber raceways after the floor is laid shall be screwed into the raceway.

When cutting through the raceway wall and setting inserts, chips and other dirt shall not be allowed to fall into the raceway and tools shall be used which are so designed as to prevent the tool from entering the raceway and injuring conductors that may be in place.

Indication of Location of Underfloor Raceways

Par. 8258. Underfloor raceways shall be laid so that a straight line from the center of one junction box to the center of the next junction box will coincide with the center line of the raceway. Raceways shall be made mechanically secure to prevent disturbing this alignment during construction.

At every end of line of duct, a fitting shall be installed extending through the floor to mark the line of the duct. Where a duct line is interrupted by another duct line, but continues in a straight line beyond, and has junction boxes or outlets on either side of the crossing line, no markers shall be deemed necessary at the interrupting point.

SECTION 826

BARE CONDUCTORS

Locations Where Bare Conductors Are Permitted

Par. 8260. Bare conductors, that is conductors without insulating covering, shall be used only as main risers or feeders in Type A, fireproof, or Type B, fire resistant, buildings, except as permitted in Paragraph 8464 for cranes, in Paragraph 8830 for grounding radio equipment and in Paragraph 8321 for electric services.

Conditions Where Bare Conductors Are Prohibited

Par. 8261. Bare conductors shall not be installed where the premises constitute a hazardous location as defined in Section 840, nor where corrosive or damp conditions exist, except in storage battery rooms as provided in Paragraph 8385.

Voltage Limit for Bare Conductors

Par. 8262. Bare conductors shall not be used in circuits that operate at more than 600 volts between any two conductors or between any conductor and the ground.

Current-Carrying Capacity of Bare Conductors

Par. 8263. Bare conductors shall be of such a size that the maximum current will not exceed 1000 amperes per square inch of cross-sectional area of conductors in unventilated enclosures and 1200 amperes per square inch in ventilated enclosures.

Method of Supporting Bare Conductors

Par. 8264. Conductors shall be supported on approved non-combustible non-absorptive insulating supports of adequate mechanical strength.

Spacings of Bare Conductors

Par. 8265. Conductors shall be so supported that a separation betwen conductors and between conductors and ground of not less than that specified in the table below will be maintained under all conditions of operation, both normal and abnormal.

TABLE 8265T

Spacing Required, Except at Switches, Circuit Breakers and Similar Equipment		
Voltage	Mounted on Same Surface	Held Free in Air
Not over 125	¾ inch	½ inch
Not over 250	1¼ inches	¾ inch
Not over 600	2 inches	1 inch

At switches, circuit-breakers, enclosed fuses, and similar equipment, parts of the same polarity may be placed as close together as convenience in handling will allow, unless close proximity causes excessive heating.

Guarding of Bare Conductors

Par. 8266. The conductors shall be placed in a chase, channel or shaft of non-combustible material which shall be so located or guarded that the conductors are not accessible to other than qualified persons.

SECTION 827

OPEN WIRING ON INSULATORS

Locations Where Open Wiring Is Permitted

Par. 8270. Open wiring on insulators may be used only for temporary wiring, such as temporary work for buildings under construction, temporary wiring for signs and carnivals, and temporary decorations and festoon lighting, and as the wiring method in cold storage rooms, ice houses, and similar locations. This method may also be used where acid fumes, such as in the pickling rooms of the metal working industries, would attack the fittings and materials of other methods.

Conditions Where Open Wiring Is Prohibited

Par. 8271. Open conductors shall not be placed in hoistways, where they may be subjected to mechanical injury, or in hazardous locations as defined in Section 840.

Types of Conductors for Open Wiring

Par. 8272. In dry places, the conductors used for open wiring shall be of the rubber-covered (R, RP, RH, or RHT), slow-burning (SB), varnished cambric (V), or asbestos (A) types.

In damp places, or in places subject to dampness, conductors shall be rubber-covered.

Where the conductors are subjected to corrosive vapors they shall be of the weatherproof (WP), varnished cambric (V) or rubber-covered (R) type.

General Installation Requirements for Open Wiring

Par. 8273. Conductors installed as open wiring shall not be dead ended at a rosette, lamp-holder, or receptacle unless the last support is within 12 inches of the same. Conductors shall be supported by means of a knob or cleat within 6 inches of a tap.

Where a change is made from open wiring to conduit, electrical metallic tubing, or surface metal raceways, an approved terminal fitting or box having a separate bushed hole for each conductor shall be used, through which fitting the conductors shall pass without splice, joint, or tap within the fitting. The use of the fitting as an outlet is prohibited.

In lieu of a box or terminal fitting, a bushing may be used where conductors leave the conduit or tubing behind a switchboard or where more than 4 conductors leave the conduit or tubing at control apparatus or in similar locations, in which case the conductors shall be bunched, taped and painted with insulating paint. The bushing shall be of the insulating type except for lead-covered conductors.

Open conductors in dry locations where not exposed to severe mechanical injury may be installed as individual conductors in approved flexible tubing, for a distance not to exceed 15 feet, the tubing to be in continuous lengths and secured to the surface wired over with suitable straps spaced not exceeding 4½ feet apart.

Method of Supporting Open Wiring

Par. 8274. Conductors installed as open wiring shall be rigidly supported on insulators. Rigid supporting requires, under ordinary circumstances, when wiring over flat surfaces, supports at least every four and one-half feet, this interval being shortened if the conductors are liable to be disturbed. In Type D, slow-burning buildings, mains not smaller than No. 8 Awg. where not liable to be disturbed, and separated at least 6 inches may be run directly from timber to timber, being supported from each timber only.

Conductors of No. 8 or larger supported on solid knobs shall be securely tied thereto. If conductors are used for tying, they should have an insulation of the same type as that of the conductors which they confine.

Multiple wire cleats shall not be employed to support conductors operating at a potential exceeding 300 volts.

Open conductors shall be separated from contact with walls, floors, timbers or partitions through which they pass by tubes or bushings composed of approved non-combustible, non-absorptive insulating material. If the bushing is shorter than the hole, a water-proof sleeve of non-inductive material shall be inserted in the hole and an insulating bushing slipped into the sleeve at either end and in such a manner as to keep the conductors absolutely out of contact with the sleeve. Each conductor shall be carried through a separate approved tube or sleeve.

When nails are used to mount knobs they shall not be smaller than 10 penny. When screws are used to mount knobs, or when nails or screws are used to mount cleats, they shall be of a length sufficient to penetrate the wood to a depth equal to at least one-half the height of the knob and fully the thickness of the cleat. Cushion washers shall be used with nails.

Conductors shall not be fastened with staples.

Spacings of Open Conductors

Par. 8275. Conductors installed as open wiring in dry places and for voltages not exceeding 300 volts shall be separated at least two and one-half inches from each other and at least one-half inch from the surface wired over; and for voltages from 301 to 600 volts the wires shall be separated at least 4 inches from each other and at least one inch from the surface wired over.

Conductors installed as open wiring in damp places shall be separated at least 1 inch from the surface wired over for all voltages and shall be so placed that an air space will be permanently maintained between them and any pipes which they cross. Conductors run in close proximity to water pipes or tanks are considered to be exposed to moisture. Where possible, wires shall be run over, rather than under, pipes upon which moisture is likely to gather or which may leak.

Conductors installed as open wiring shall be permanently separated at least 2 inches from metallic conduit, piping, or other conducting material, or from any exposed lighting, power, or signal conductor, unless separated therefrom by a firmly fixed and continuous non-conductor additional to the insulation on the wire. Where an insulating tube is used it shall be secured at the ends.

Protection of Open Wiring From Mechanical Injury

Par. 8276. Where open wiring is exposed to mechanical injury it shall be protected by one of the methods listed below. Conductors within seven feet from the floor shall be considered exposed to mechanical injury.

By guard strips of wood not less than ⅞ inch in thickness and at least as high as the insulating supports, placed on each side of and close to the wiring.

By a substantial running board back of the wires with side protections, made of at least one-half inch stock. Running boards shall extend at least one inch outside the conductors, but not more than two inches and the protecting sides shall be at least two inches high and at least seven-eighth inch thick.

By boxing made as above and furnished with cover kept at least one inch away from the conductors within. Where protecting vertical conductors on side walls the boxing shall be closed at the top and the holes through which the conductors pass shall be bushed.

By conduit in which case the rules for conduit shall be followed or by metal piping in which case the conductors shall be encased in continuous lengths of approved flexible tubing. The conductors passing through conduit or piping shall be so grouped that current in both directions is practically equal.

Open Wiring Entering Moist Locations

Par. 8277. Where conductors installed as open wiring enter or leave buildings or rooms subject to moisture or corrosive vapors, they shall have drip loops formed on them and shall then pass upward and inward from the outside of buildings, or from the room subject to moisture or corrosive vapors, through incombustible, non-absorptive tubes.

SECTION 828

INSTALLATION OF ELECTRICAL BOXES, CABINETS AND FITTINGS

General Requirements for Electrical Boxes, Cabinets and Fittings

Par. 8280. Electrical boxes, cabinets and fittings shall be installed where they are required by Paragraphs 8203 and 8501.

Except in walls or ceilings of concrete, brick, tile, or other incombustible material, a plaster surface which is broken or incomplete shall be repaired so that there will be no gaps or open spaces at the edge of a box or fitting set into the wall or ceiling.

Unused openings in boxes, fittings and cabinets shall be effectively closed to afford protection substantially equivalent to that of the wall of the box, fitting or cabinet. Metal plugs or plates shall not be used with non-metallic boxes, fittings or cabinets unless recessed at least one-quarter inch from the outer surface.

In moist places, boxes, cabinets and fittings shall be so placed or equipped as to prevent moisture from entering and accumulating within the box, cabinet or fitting.

Type of Electrical Box, Cabinet or Fitting

Par. 8281. Electrical boxes, cabinets and fittings installed outdoors shall be weatherproof. Ferrous metal boxes and fittings protected from corrosion solely by enamel may be used only indoors and in occupancies not subject to severe corrosive influences. When they are installed in the hazardous locations described in Section 840, they shall be special types complying with the requirements of that Section. Boxes and fittings for receptacles located in floors shall be approved for the purpose.

Boxes and fittings used to enclose flush devices shall be of such design that the devices will be completely enclosed on back and sides and that substantial support for the devices will be provided. The screws that attach the device to the box or fitting shall not be used for supporting the enclosure.

Outlet and switch boxes for concealed work shall have an internal depth of at least one and one-half inches except that where the installation of such a box would result in injury to the building structure or is impracticable, a box not less than one-half inch internal depth may be installed.

Round outlet boxes shall not be used where conduits or connectors requiring the use of locknuts or bushings are to be connected to the side of the box.

Wiring Spaces in Cabinets and Cutout Boxes

Par. 8282. Cabinets and cutout boxes which contain devices or apparatus connected within the cabinet or box to the conductors of more than four circuits, including branch circuits, meter loops, sub-feeder circuits, power circuits, and similar circuits, but not including the supply circuit or a continuation thereof, shall be provided with back wiring spaces, side gutters or wiring compartments.

Covers for Electrical Boxes and Fittings

Par. 8283. Each electrical box and fitting shall be provided with a cover unless a fixture canopy is used or unless the device mounted on the box serves as a cover.

Non-metallic covers and plates shall be used with non-metallic boxes, except that a metal cover or plate may be used when covered on the exposed side with non-metallic material. Screws shall not be used for fastening such covers or plates to non-metallic boxes unless located in such position that they cannot come in contact with live parts or live conductors in the box, or unless the exposed screw heads are covered with non-metallic material.

When a fixture canopy is used, any combustible wall or ceiling finish exposed between the edge of the canopy and the outlet box shall be covered with incombustible material.

Covers of outlet boxes and fittings having holes through which flexible cord pendents pass shall be provided with bushings designed for the purpose or shall have smooth, well-rounded surfaces on which the cord may bear. So-called hard-rubber or composition bushings shall not be used. Where conductors other than flexible cord pass through a metal cover there shall be provided a separate hole for each conductor, each hole being equipped with a bushing of insulating material.

Number of Conductors Permitted in Boxes

Par. 8284. Outlet and junction boxes shall be of sufficient size to provide free space for all conductors, except fixture conductors, running through without splice or joint or terminating therein, in accordance with the following table:

TABLE 8284T1

Size of Conductor	Free Space Within Box for Each Conductor
No. 14	2. Cubic inches
12	2.25 “
10	2.5 “
8	3. “

For the patterns of boxes in common use, and when no fittings such as fixture studs or hickeys are located in the box, the foregoing will generally permit:

TABLE 8284T2

Box Dimensions	Maximum Number of Wires			
	No. 14	No. 12	No. 10	No. 8
1½x3¼ octagonal	5	5	4	0
1½x4 octagonal	8	7	6	5
1½x4 square	11	9	7	5
1½x4-11/16 Square	16	12	10	8
2⅛x4-11/16 Square	20	16	12	10
1¾x2¾x2	5	4	4	..
1¾x2¾x2½	6	6	5	..
1¾x2¾x3	7	7	6	..

For so-called shallow boxes of less than one and one-half inches depth, the number of conductors, except fixture wires, running through without splice or joint or terminating in an outlet or junction box shall be limited in accordance with the following table:

TABLE 8284T3

Box Dimensions	Maximum Number of Wires		
	No. 14	No. 12	No. 10
3½ Shallow	4	4	3
4 Shallow	6	6	4
4-11/16 Square Shallow	8	6	6

Where a fixture stud, cable clamp, or hickey is contained in a box, the number of conductors permitted shall be one less than shown in Tables 8284T2 and 8283T3 and where a switch or receptacle is contained in a box, the number of conductors permitted shall be two less.

These limitations are not intended to be applied to terminal housings supplied with motors, nor to types of boxes or fittings without knockouts and having hubs or recessed ports for terminal bushings and locknuts.

Conductors Entering Boxes, Cabinets or Fittings

Par. 8285. Where metal boxes, cabinets or fittings are used with open wiring, conductors shall enter through insulating bushings or, in dry places, through flexible tubing extending from the last insulating support and firmly secured to the box or fitting. Openings through which the conductors enter shall be adequately closed.

Where raceway or cable is used with metal boxes, cabinets, or fittings, the raceway or cable shall be secured to the boxes, cabinets, or fittings. The conductors entering the box, cabinet or fitting shall be protected from abrasion and the openings through which the conductors enter shall be adequately closed.

Non-metallic outlet boxes shall be used only with open work or non-metal clad wiring. In open wiring the individual conductors shall enter the non-metallic box through individual holes. Where flexible tubing is used to encase the conductor between the last support and the box, this shall be run into the box or terminated at the wall of the box. Openings through which the conductors or cables enter boxes shall be adequately closed.

Conductors entering boxes or fittings through holes in the covers shall comply with the requirements of Paragraph 8283.

Conductors of No. 1, or larger, shall not be deflected where they enter or leave a cabinet unless a gutter having a minimum width in accordance with the following table is provided:

TABLE 8285T

Conductor Size	Width of Gutter
No. 1 Awg, and smaller........	3 inches, minimum
No. 4/0 Awg, and smaller.......	4 inches, minimum
500,000 c. m. and smaller.......	6 inches, minimum
900,000 c. m. and smaller.......	8 inches, minimum
1,400,000 c. m. and smaller.......	10 inches, minimum
2,000,000 c. m. and smaller.......	12 inches, minimum

Where ungrounded conductors of No. 1 or larger enter a cabinet, pull box, junction box or auxiliary gutter, and are deflected more than 30 degrees where leaving the raceway, the conductors shall be protected by a substantial bushing providing a smoothly rounded insulating surface, unless the conductors are separated from the raceway fitting by substantial insulating material securely fastened in place. Where conduit bushings are constructed wholly of insulating material, a locknut shall be provided both inside and outside the enclosure to which the conduit is attached.

Supports for Electrical Boxes, Cabinets and Fittings

Par. 8286. Electrical boxes, cabinets and fittings shall be securely fastened in place. Boxes and fittings, not over 100 cubic inches in size, which are attached to firmly secured exposed raceway by threading or other connection designed for the purpose, are considered as so fastened.

In concealed work in new buildings, outlet boxes and fittings, unless securely held in place by concrete, masonry or other building material in which they are embedded, shall be secured to a stud, joist or similar fixed structural unit, or to a metal or wooden support which is secured to such a structural unit. Wooden supports shall be not less than seven-eighths inch in thickness. Lath of wood, metal or composition shall not be considered a structural unit.

In exposed work, and in concealed work in existing buildings where conductors or cables are fished and outlet boxes cannot be secured as required in new buildings, without disturbing the building finish, the boxes may be mounted directly upon the plaster surface when securely fastened in place.

Outlet boxes used where gas outlets are present shall be so fastened to the gas pipes as to be mechanically secure.

Screws for supporting the box shall not be used in attachment of the device contained therein.

Position of Electrical Boxes, Cabinets and Fittings

Par. 8287. In walls or ceilings of concrete, tile, or other incombustible material, boxes, cabinets and fittings shall be so installed that the front edge will not set back of the finished surface more than one-quarter inch. In walls or ceilings constructed of wood or other combustible material, boxes, cabinets and fittings shall be flush with the finished surface or projections therefrom.

Junction boxes shall be so installed that the wiring contained in them may be rendered accessible without removing any part of the building.

Exposed Extensions From Concealed Outlets

Par. 8288. In making an exposed extension from an existing outlet of concealed wiring, a box, extension ring or blank cover shall be mounted over the original box and electrically and mechanically secured to it. The extension shall then be connected to this box in the manner prescribed for the method of wiring employed in making the extension.

Pull Boxes

Par. 8289. Pull boxes installed in runs of 1¼ inch trade size and larger raceways shall have a length of not less than eight times the trade diameter of the largest raceway where the pull is straight. Where angle or U pulls are made, the distance between each terminal fitting of a raceway inside the box and the opposite wall of the box shall not be less than six times the trade diameter of the raceway and this distance shall be increased by the sum of the diameters of all other raceways entering the box.

In large pull boxes, all conductors shall be cabled or racked up in an approved manner.

SECTION 829

MISCELLANEOUS WIRING METHODS

Underplaster Extensions of Electric Circuits

Par. 8290. Underplaster extensions may be used only in Type A, Fireproof, or Type B, Fire-resistant, buildings for the sole purpose of supplying additional outlets from existing 15-ampere or 20-ampere branch circuits.

Such extensions shall be laid on the face of the masonry and shall then be buried in the plaster finish. They shall be run in rigid or flexible conduit, armored cable, electrical metallic tubing or metal raceways approved for the purpose. Standard sizes of conduit, cable, tubing and raceways shall be used except that for single conductors only, conduit or tubing having not less than five-sixteenths of an inch inside diameter or single-conductor armored cable may be used.

No such extension shall extend beyond the story on which it originates unless standard sizes of rigid conduit, electrical metallic tubing or armored cable are employed.

The methods of installation for such extensions shall be as specified elsewhere in this Chapter for the particular type of material used, except that when alternating current is to be employed, all of the conductors of a circuit need not be contained in a single raceway or cable.

Surface Wooden Raceways for Electric Circuits

Par. 8291. Surface wooden raceways shall be used only for enclosing ground wires that normally do not carry current, for fire alarm systems in accordance with the requirements of Section 895, or for enclosing wiring between meter-service entrance equipment and the fuse box or fitting terminating the customer's wiring at the meter location. They shall be installed only in dry locations and shall be run exposed.

Surface wooden raceways shall not be used where subject to severe mechanical injury or to corrosive vapors, in hoistways, nor in a hazardous location as defined in Section 840.

The raceways shall be securely fastened in place.

Cellular Metal Floor Raceways

Par. 8292. For the purposes of this Paragraph, cellular metal floor raceways shall be defined as the hollow spaces of cellular metal floors, together with suitable fittings, which may be approved as enclosures for electrical conductors; a cell shall be defined as a single, enclosed tubular space in a cellular metal floor member, the axis of the cell being parallel to the axis of the metal floor member; a header shall be defined as a transverse raceway providing access to predetermined cells of a cellular metal floor, thereby permitting the installation of electrical conductors from a distribution center to the cells.

Cellular metal floor raceways shall be installed in accordance with the requirements of Section 825 for the installation of underfloor raceways, insofar as they are applicable, except that cellular metal floor raceways shall not be installed in theaters and shall not contain any conductor larger than No. 0.

No electric conductors shall be installed in any cell or header which contains a pipe for steam, water, gas, drainage, or other non-electrical service.

Rubber Sheathed Cable for Electric Circuits

Par. 8293. Rubber-sheathed multiple-conductor or other approved non-metallic waterproofed cable shall be used only for exposed wiring in breweries, ice plants, cold storage warehouses and similar wet locations, if the voltage does not exceed 300 volts between conductors or 150 volts to ground.

The individual conductors of the rubber sheathed cable shall not be smaller than No. 12 Awg, except that the cable may contain an approved size of conductor, with or without individual insulation, to be used for equipment grounding purposes only.

All outlet boxes, fittings, and cabinets used with rubber-sheathed cable shall be of approved type constructed of cast metal, insulating material, or other material approved for the purpose, and the cable shall be securely fastened to all such outlet boxes, fittings, and cabinets with a fitting which provides a moisture-proof seal.

Switch plates, fixtures, and similar parts shall be of insulating material when mounted on boxes, fittings, and cabinets of insulating material.

Rubber-sheathed cable shall be supported on insulators approved for the purpose spaced at intervals not exceeding three feet.

The cable shall be enclosed in rigid conduit, electrical metallic tubing, or approved insulating tubing, where passing through walls and where so enclosed, the enclosure shall be sealed with a suitable fitting. Where exposed to mechanical injury, the cable shall be protected.

When metal boxes, fittings, or cabinets are used with rubber sheathed cable, they shall be grounded in accordance with the requirements of Chapter 86.

Flexible Cords in Electric Circuits

Par. 8294. Flexible cords shall be used only for pendants, wiring of fixtures, elevator cables, connection of portable appliances, or as a part of approved stationary devices to prevent transmission of noise or vibration, or for plug and receptacle connections to facilitate interchange of devices.

Flexible cords shall be suitable for the conditions of use and location and shall be used only in continuous lengths without splice or tap.

Flexible cords shall conform to the description of the various types in Paragraph 8114. Flexible cords of other types than those listed and other uses for types listed shall be the subject of special investigations and shall not be used before being approved.

Flexible cords used to connect smoothing irons, or to connect portable electrically-heated appliances rated at more than 50 watts and which produce temperatures in excess of 250 degrees Fahrenheit (120 degrees Centrigrade) on surfaces with which the cord is liable to be in contact, shall be one of the types of approved heater cords listed in Paragraph 8114.

All other portable electrically-heated appliances shall be connected by one of approved types of cord listed in Paragraph 8114, selected in accordance with the usage specified therein.

Flexible cords used in show-windows or in show-cases shall be of Type S or AFS, except for the wiring of chain fixtures, and for supplying current to portable lamps and other merchandise for exhibition purposes.

When the voltage between any two conductors exceeds 300, but does not exceed 600, flexible cords of No. 10 and smaller shall have rubber insulation on the individual conductors at least three-sixty-fourths of an inch in thickness, unless Type S cord is used.

Flexible cords shall be not smaller than required for the rated current of the appliance by Paragraph 8050.

Flexible cords shall not be smaller than No. 18, except that tinsel cords, or cords having equivalent characteristics, of smaller size may be approved for use with specific appliances.

For the overcurrent protection of flexible cords, refer to Paragraph 8515.

Flexible cords shall be so connected to devices and to fittings that tension will not be transmitted to joints or terminal screws. This shall be accomplished by a knot in the cord, winding with tape, by a special fitting designed for that purpose, or by other equivalent means.

Flexible cords shall be protected by insulating bushings where they enter lampholders.

Flexible cords shall be protected by bushings where they pass through the cover of an outlet box, or the cover shall have a smooth, well-rounded surface on which the cord will bear. So-called hard-rubber or composition bushings shall not be used.

Outside Wiring

Par. 8295. This paragraph is not intended to regulate overhead distribution lines except insofar as the safety of wiring systems in, on, or between buildings is affected, and except where, on account of proximity to a building, the safety of the building itself or of its occupants is affected.

For outside wiring in connection with services, signs and outline lighting, and signal systems, refer to Sections 832, 890 and 892, respectively.

Wiring on the exterior of building walls shall be installed in rigid metal conduit, electrical metallic tubing, as open wiring on insulators, or in cable approved for the purpose. For circuits operating at more than 600 volts, conductors shall be in rigid conduit.

Conduit and electrical metallic tubing on exterior of buildings shall be made rain-tight and suitably drained. Conductors in raceways or cables shall have rubber covering.

Open conductors on insulators shall have rubber or weatherproof covering.

Open conductors not exposed to the weather shall be rigidly supported on glass, porcelain, or approved composition knobs, placed at intervals not exceeding four and one-half feet, and shall be separated not less than two and one-half inches from each other and one inch from the surface wired over. Where exposed to the weather, conductors shall be supported on insulators, racks, or brackets designed for the purpose, placed at intervals of not exceeding 9 feet, separating the conductors at least 6 inches from each other and at least 2 inches from the surface wired over; provided that supports may be placed at intervals not exceeding 15 feet where conductors are separated at least 12 inches from each other.

Open conductors shall be separated from open conductors of other circuits or systems by not less than 4 inches.

Open conductors shall not be within 8 feet from the ground, shall not be readily accessible and shall not be subject to mechanical disturbance. Conductors within 8 feet from the ground, when readily accessible, or when subjected to mechanical disturbance, shall be protected by conduit, electrical metallic tubing, or equivalent protection.

Open conductors where they enter or leave a building shall pass upward and inward through slanting incombustible, nonabsorptive insulating tubes. Drip loops shall be formed on the conductors before they enter the tube.

Open conductors operating at potentials in excess of 300 volts shall not come closer to any building or its attachments (balconies, platforms, cornices, etc.) than the clearances given in the following table:

TABLE 8295T

Voltage	Horizontal Clearance	Vertical Clearance
300 to 600...........	3 feet	8 feet
600 to 5,000...........	6 feet	8 feet
5,000 to 15,000...........	8 feet	8 feet
Above 15,000	10 feet	10 feet

When buildings exceed 3 stories, or 50 feet in height, overhead lines shall be arranged where practicable so that a clear space (or zone) at least 6 feet wide will be left either adjacent to the buildings or beginning not over 8 feet from them, to facilitate the raising of ladders when necessary for fire fighting.

Overhead conductors shall be so placed that moisture is not liable to form a cross connection between them. Line conductors shall be not less than one foot apart except when installed on racks or brackets, and shall not come in contact with anything but their supports.

Conductors shall be mounted with a clearance from ground as follows:

Conductors above all streets, alleys, and above driveways on other than residential property shall have a clearance above ground of not less than 18 feet, and when more than 600 volts, 20 feet.

Conductors supplying lights in automobile parking lots and other similar commercial areas shall have a clearance above ground of not less than 12 feet.

On residential properties, and elsewhere across spaces accessible to pedestrians only, conductors between buildings shall have a clearance above ground of not less than 10 feet for wires not more than 150 volts to ground, and 12 feet for higher voltages to ground. Greater clearances shall be provided when, in the judgment of the Buildings Engineer, it is necessary to prevent disturbance of the conductors.

Wherever practicable, conductors crossing over buildings shall be supported on structures which are independent of the buildings but where it is necessary to attach them to roofs, the roof structures shall be substantially constructed.

Conductors supported on poles shall be mounted so as to provide a climbing space adjacent to the pole with not less than the following horizontal dimensions:

Power conductors, below communication conductors	30 inches
Power conductors alone or above communication conductors:	
Less than 300 volts	24 inches
Exceeding 300 volts	30 inches
Communication conductors below power conductors	Same as the power conductors
Communication conductors alone or above power conductors	No requirement

Communication conductors supported by the same pole as power conductors shall preferably be located below the power conductors.

Telephone, telegraph, or other communication conductors shall not enter any building from a pole-line where these conductors are supported on a crossarm used also to support electric light and power conductors, except communication conductors used for operating purposes by an operating utility and entering buildings used for such purposes.

Conductors running up a pole shall be protected from mechanical injury to a point at least 8 feet from the ground. Where such pole is also used to support conductors operating at a voltage in excess of 600, the conductors running up the pole shall be covered with fiber conduit or equivalent insulating means from a point 8 feet above the ground to their point of termination on the pole. Overhead conductors shall not be smaller than No. 10 for spans up to 50 feet in length, and not smaller than No. 8 for longer spans.

Installation of Guy Wires for Electrical Structures

Par. 8296. Where guys are necessary for poles, towers, or other structures supporting overhead conductors, they shall be installed in such a manner as to have adequate mechanical strength, to prevent injury to the pole or other structure, and to be rigidly anchored. All metal parts shall be suitably protected from corrosion.

A strain insulator shall be inserted in every guy that comes within 8 feet of the ground at a point between 6 and 8 feet in horizontal distance from the pole. When a point 6 feet from the pole would be less than 8 feet above the ground, the strain insulator shall be placed 8 feet in vertical distance above the ground.

A second strain insulator shall be inserted in every guy which passes over or under or in any way is exposed to possible contact with conductors of more than 300 volts to ground, which is attached to a conducting support such as a rock, iron pole, bridge, or other metallic or conducting object, or which is attached to a building or other structure. In such guys the second strain insulator shall be placed at a point between 6 and 8 feet from the pole, stub, tree, rock, structure, anchor or other object to which the farther end of the guy is attached. When this point would be less than 8 feet above the ground, the strain insulator shall be placed 8 feet in vertical distance above the ground.

Strain insulators shall be so designed that a rupture of the insulating material will not result in parting the guy and shall have mechanical strength equal to the tensile strength of the guys in which they are used and electrical properties suitable to the voltages to which the guys are exposed.

The ground end of all guys in the possible path of traffic shall be provided with a substantial and conspicuous wood or metal guard not less than 8 feet long.

Installation of Trolley Wires

Par. 8297. Trolley wires shall have at least two separate and distinct insulations from the ground. A wooden pole or structure shall be considered as one insulation.

Trolley wires and feeders shall be provided with a means by which they can be disconnected from their source of current.

Outside Festoon Lighting

Par. 8298. Conductors used for outside festoon lighting shall be rubber-covered and shall be not smaller than No. 14 except that when lampholders of the intermediate or smaller sizes are used, the conductors shall be not smaller than No. 18.

The overcurrent protection, even though the conductors are rubber-covered, may be based on the current carrying capacity shown in the last column of Table 8050T.

Lampholders shall be of approved molded composition, weatherproof type, and when they are attached as pendents shall have the connections to the circuit wires staggered. When lampholders have terminals of a type which puncture the insulation and make contact with the conductors, they shall be attached only to conductors of the stranded type.

All joints shall be made mechanically secure and soldered, unless made with solderless connectors of a type suitable for outside use, and shall be covered with both rubber and friction tape, and painted with an insulating paint.

In spans exceeding 40 feet the conductors shall be supported by a messenger wire substantially fastened at each end. Conductors and messenger wires shall be supported by secure attachments to buildings, poles, or other adequate supports by means of strain insulators. Conductor or messenger wires shall not be attached to any fire escape, downspout or plumbing equipment.

Conductors in spans shall clear the ground by at least 10 feet on residential properties accessible to pedestrians only, and in all other cases by at least 12 feet.

CHAPTER 83

INSTALLATION OF ELECTRICAL EQUIPMENT

Sec. 830—General Requirements for the Installation of Electrical Equipment.
Sec. 831—Polarity Identification of Systems and Circuits.
Sec. 832—Electrical Services.
Sec. 833—Installation of Switches, Switchboards and Panelboards.
Sec. 834—Installation of Generators and Motors.
Sec. 835—Installation of Electrical Fixtures, Receptacles, and Rosettes.
Sec. 836—Installation of Transformers and Construction of Vaults.
Sec. 837—Installation of Capacitors, Resistors and Reactors.
Sec. 838—Installation of Storage Batteries.
Sec. 839—Electrical Appliances.

SECTION 830

GENERAL REQUIREMENTS FOR THE INSTALLATION OF ELECTRICAL EQUIPMENT

Mounting of Electrical Equipment

Par. 8300. Electrical equipment shall be installed in a neat and workmanlike manner and shall be firmly secured in place.

Wooden plugs driven into holes in masonry, concrete, plaster, or similar materials shall not be depended on for security.

Enclosure of Arcing Parts of Electrical Equipment

Par. 8301. Parts of electrical equipment, other than motors or generators, which in ordinary operation produce arcs, sparks, flames or molten metal, shall be enclosed unless separated and isolated from all combustible material. For hazardous locations refer to Section 840.

Guarding of Live Parts of Electrical Equipment

Par. 8302. Except as elsewhere required or permitted by this Code, exposed live parts of electrical equipment operating at 50 volts or more shall be guarded against accidental contact by enclosure or by locating the equipment as follows:

In a room or enclosure which is accessible only to qualified persons.

On a suitable balcony, gallery, or platform, so elevated and arranged as to exclude unqualified persons.

Elevated 8 feet or more above the floor.

So that it will be protected by a guard rail if the equipment operates at 600 volts or less. For motors, refer to Paragraph 8341.

SECTION 831

POLARITY IDENTIFICATION OF SYSTEMS AND CIRCUITS

General Requirements for Polarity Identification

Par. 8310. All interior wiring systems, except as provided in Paragraph 8316, shall have a grounded conductor which is continuously identified throughout the system.

Connection of Identified Electrical System to Supply

Par. 8311. No interior wiring shall be electrically connected to a supply system unless the latter contains, for any grounded conductor of the interior system, a corresponding conductor which is grounded.

Circuits Derived from Auto-Transformers

Par. 8312. Wiring systems and circuits derived from transformers in which part of the turns are common to both primary and secondary circuits, ordinarily known as auto-transformers, shall not be permitted for any interior wiring system unless the system supplied contains an identified grounded conductor which is solidly connected to a similar identified grounded conductor of the system supplying the auto-transformers.

Refer to Paragraph 8362 for other conditions under which the use of auto-transformers is permitted.

Means of Identification of Conductors and Cables

Par. 8313. Identification for conductors shall be secured as follows:

Single insulated conductors of No. 6 or smaller, intended for use as identified conductors of circuits, except conductors of the weatherproof type, shall have an outer identification of a white or natural gray color. Twin and twisted-pair conductors and three-conductor cables shall have one conductor, and four-conductor cables shall have at least one conductor identified in this manner. The coverings of single conductors, intended for use as unidentified conductors, and the coverings of conductors other than the identified conductor in multi-conductor cables, shall be finished to show a color or combination of colors other than, and contrasting with, white or natural gray.

Insulated conductors larger than No. 6, and weatherproof conductors of all sizes when used indoors, shall have an outer identification as specified above or shall be identified by a distinctive marking at terminals applied during process of installation.

In lieu of a white covering on the identified grounded conductor, the identification may be secured by entirely omitting the covering and insulation on services, feeders and range wiring only, provided that the circuit operates on alternating current at not more than 150 volts to ground, the wiring method is rigid conduit or electrical metallic tubing, and the requirements of Paragraphs 8043, 8050, 8330 and 8350 are complied with.

Means of Conductor Identification in Flexible Cords

Par. 8314. One conductor of flexible cords shall have a continuous identifying marker readily distinguishing it from the other conductors. This marker shall comply with the requirements of Paragraph 8114.

Use of Identified Conductors

Par. 8315. Conductors having white or natural-gray covering shall not be used other than as conductors for which identification is required by this Section except under the following conditions:

Identified conductors, rendered permanently unidentified by painting or other effective means at each outlet where the conductors are visible and accessible, may be used as unidentified conductors. This permits the use of two-wire cable having one black and one white conductor on two-wire circuits tapped from the outside legs of a three-wire system or any two conductors of a multiwire system if the identified conductor of the two-wire cable is rendered permanently unidentified at terminals.

Cable containing an identified conductor may be used for single-pole switch loops if the connections are so made that the unidentified conductor is the return conductor from the switch to the outlet. This exception makes it unnecessary to paint the terminal of the identified conductor at the switch outlet.

Unidentified Circuits Permitted

Par. 8316. Two-wire branch circuits and multi-wire A. C. circuits may be tapped from the ungrounded conductors of circuits having identified grounded neutrals. Switching devices in such circuits shall have a pole in each ungrounded conductor, except as provided for motor controllers in Paragraph 8343. Polyphase circuits need not have one conductor grounded and identified regardless of whether or not the supplying system contains a grounded neutral. Other unidentified ungrounded systems or circuits may be used only by special permission.

Identification Requirements for Terminals of Electrical Equipment

Par. 8317. All devices provided with terminals for the attachment of conductors and intended for connection to more than one side of the circuit shall, unless specifically excepted, have a pair of connecting terminals properly marked for identification, unless the electrical connection between the pair of terminals intended to be connected to the grounded conductor is clearly evident.

Panelboards and Devices: The terminals of lighting panelboards and of devices having a normal current rating of over 30 amperes need not be marked for identification, except as required in this paragraph for polarized receptacles for attachment plugs and polarized attachment-plug caps.

Utilization Appliances: The terminals of utilization appliances need not be marked to indicate the proper connection to the grounded conductor. If the terminals of utilization appliances, of which single-pole switches form an integral part, are marked for identification, the terminal connected to the switch shall be the unidentified terminal.

Portable Appliances: The terminals of portable appliances need not be marked for identification.

Single-pole Devices: Devices, to the terminals of which only one side of the line is connected, need not have terminals marked for identification.

Two-wire Receptacles and Caps: Two-wire attachment-plug receptacles without screw shells, and two-wire attachment plug caps, unless of the polarity type, need not have their terminals marked for identification. Two-wire polarized receptacles for attachment plugs and polarized attachment-plug caps shall have the terminal intended for connection to the grounded conductor marked for identification.

Three-wire Receptacles and Caps: Three-wire attachment-plug receptacles and three-wire attachment-plug caps, in which one terminal may be used for the connection of a grounding conductor, shall have such terminal identified in a manner differing from that specified in Paragraph 8318. The other terminal need not be marked for identification.

Screw-shells: In the case of devices with screw-shells, the identified terminal shall be the one connected to the screw-shell. This does not apply to screw-shells which serve as fuseholders.

Screw-shells with Leads: In the case of screw-shell devices with attached leads, the conductor attached to the screw-shell shall have white or natural-gray finish. The outer finish of the other conductor shall be of a solid color that will not be confused with the white or natural-gray finish which is to indicate the grounded conductor.

Means of Identification of Terminals of Electrical Equipment

Par. 8318. The marking of terminals shall be done by means of a metallic plated coating substantially white in color, as nickel or zinc, or the terminals may be of material substantially white in color. The other terminals shall be of a readily distinguishable different color.

Continuity of Identified Conductor

Par. 8319. No switch or automatic over-current protective device shall be placed in any identified, grounded conductor of an interior wiring system unless the switch or device simultaneously opens all conductors of the circuit.

SECTION 832

ELECTRIC SERVICES

Scope of Electric Services

Par. 8320. The provisions of this Section apply to that part of the wiring system used in the delivery of electric energy at a potential not exceeding 600 volts from a source of supply outside the premises served to the wiring system on or within a building or premises.

For services operating at more than 600 volts, refer to the additional requirements of Chapter 87.

General Requirements for Electric Services

Par. 8321. *Service Conductors:* Service conductors shall be installed so as to be isolated from or protected from mechanical injury. Attachment of overhead conductors should be so made as to provide necessary clearance for the use of ladders and safety equipment.

One Set of Service Conductors Only: In general a building shall be supplied through only one set of service conductors, except:

Where more than one service drop is permitted by Paragraph 8323.

Buildings of multiple tenancy may have two or more separate sets of service-entrance conductors which are tapped from one service drop, or two or more sub-sets of service-entrance conductors may be tapped from a single set of main service conductors.

In a single occupancy requiring services of more than one characteristic, a set of service conductors may be installed for each class of current.

Service Equipment Grouped: When supplied at the same side of the building by more than one overhead service drop or more than one set of underground service conductors, the service equipments, except for multiple service drops as permitted in Paragraph 8323, shall be grouped and each set of equipment marked to identify it.

Service From One Building Through Another: No overhead service, no underground service, and no service from an isolated plant shall supply one building through another, unless such buildings are under single occupancy or management. Conductors in conduit or duct placed under at least two inches of concrete beneath a building, or buried in two inches of brick masonry or in concrete within a wall, shall be considered outside the building.

Insulation of Service Conductors: Service conductors shall have an insulating covering which will normally withstand exposure to atmospheric and other conditions of use and which shall prevent any detrimental leakage of current to adjacent conductors, objects, or the ground. In the case of service conductors that have a nominal voltage to ground of not more than 208 volts, a grounded neutral service conductor without an insulating covering may be installed. Except in the service drop, such an uninsulated conductor shall be part of an approved type of service cable or shall be installed in a rigid metal raceway.

Size of Service Conductors: Service conductors shall have adequate current-carrying capacity to safely conduct the current for the loads supplied without a temperature rise detrimental to the insulating covering of the conductors, and shall have adequate mechanical strength.

Service-entrance conductors shall be not smaller than is required by Paragraph 8050 for the current they carry, the load being computed in accordance with Paragraph 8031 and, in no case, smaller than No. 8.

The neutral service conductor shall have a current-carrying capacity in conformity with the requirements of Paragraph 8032, but not smaller than No. 8.

Service-Entrance Conductors Without Splice: Service-entrance conductors shall be without splice except as follows:

Clamped or bolted connections in a meter enclosure are permitted.

Taps to main service conductors are permitted as provided in this Paragraph for buildings of multiple tenancy having one service drop or set of main service conductors, or to individual sets of service equipment as provided in Paragraph 8325.

A connection is permitted, when properly enclosed, where an underground service conductor enters a building and is to be extended to the service equipment or meter in another form of approved service raceway or service cable.

A connection is permitted where service conductors are extended from a service drop to an outside meter location and returned to connect to the service-entrance conductors of an existing installation.

Conductors in Service Raceway: Conductors other than service conductors, grounding conductors, or control conductors from time switches having over-current protection, shall not be installed in the service raceway.

Enclosure of Equipment: Live parts of service equipment shall be enclosed so that they will not be exposed to accidental contact, unless mounted on a switchboard, panelboard or controller accessible to qualified persons only and located in a room or enclosure free from easily ignitible material. Such an enclosure shall be provided with means for locking or sealing doors giving access to live parts.

Hazardous Locations: Service equipment shall not be installed in hazardous locations unless it is impracticable to locate it elsewhere. When an installation must be made in such locations, it shall comply with the requirements of Section 840.

Grounding: Electric services shall be grounded in accordance with the requirements of Sections 860 to 864, inclusive.

Underground Electric Services

Par. 8322. *Type of Cable:* Except when a bare neutral is permitted, as provided in Paragraph 8321, underground service conductors up to the point of attachment to service equipment shall be insulated with rubber, cambric, paper, or other approved material. Where they are installed underground, in concrete or other masonry in direct contact with earth, or are otherwise exposed to moisture, they shall be lead covered or of other type specially approved for the purpose.

Protection Underground: Underground service conductors shall be protected against mechanical injury by being installed in duct, conduit, in the form of a cable approved for the purpose or by other means.

Protection on Poles: When underground service conductors are extended up a pole they shall be protected by rigid conduit to a point at least 8 feet above the ground, and insulated from this point to their termination on the pole by fiber conduit or other approved insulating means.

Protection Where Entering Building: Where underground service conductors enter a building, they shall have mechanical protection in the form of rigid or flexible conduit, electrical metallic tubing, auxiliary gutters, the metal tape of an approved service cable, or other approved means. The mechanical protection shall extend to the enclosure for the service equipment unless the service switch is installed on a switchboard, in which case a bushing shall be provided which, except where lead-covered conductors are used, shall be of the insulating type.

Sealing End of Raceway: Where a service raceway or duct enters from an underground distribution system, the end within the building shall be sealed with suitable compound so as to prevent the entrance of moisture or gases.

Electric Service Drops

Par. 8323. *Insulation:* Except when a bare neutral is permitted, as provided in Paragraph 8321, service drop conductors shall be rubber-covered except that open individual conductors may be weatherproof (Type WP).

Size of Conductors: Conductors in service drops shall be not smaller than No. 10 when of soft copper, or No. 12 when of medium or hard-drawn copper.

Number of Drops: No building shall be supplied from the same transformer, or from the same secondary distribution system, through more than one service drop, except as follows:

When a separate service is required for fire pumps.

When a separate service is required for emergency lighting purposes.

When capacity requirements make multiple services desirable.

By special permission of the Buildings Engineer, when more than one service drop is necessary due to the area over which a single building extends.

By special permission of the Buildings Engineer, in multiple tenancy buildings where there is no available space for service equipment accessible to all of the tenants.

Distance Above Buildings: Service-drop conductors shall be so installed that a distance not less than 8 feet will be maintained from buildings over which they pass.

Supports Independent of Building: Where practicable, conductors passing over a building shall be supported on structures which are independent of the building. Where it is necessary to attach conductors to a roof, they shall be supported on substantial structures.

Not Readily Accessible: Service drops shall not be readily accessible.

Attachment to Buildings: The point of attachment of a service drop to a building shall be not less than 14 feet above ground, except over private property where specifically permitted to be less by the Buildings Engineer, but never less than 10 feet. Proper clearance from other conductors or obstructions shall be provided.

Open individual conductors shall be attached to buildings by means of approved insulating supports. Multiple-conductor cables used for service drops shall be attached to buildings by fittings approved for the purpose.

Service Conductors On Or In Buildings

Par. 8324. *Insulation:* Except when a bare neutral is permitted, as provided in Paragraph 8321, service conductors extending along the exterior of or entering buildings shall be rubber-covered when in raceways; open individual conductors on the exterior of buildings may be weatherproof (Type WP).

Wiring Methods: Service-entrance conductors shall be enclosed in rigid conduit, in electrical metallic tubing, or on private property, in cable approved by the Buildings Engineer for the purpose. Service conductors extending along the exterior of buildings shall be installed in the same manner as service-entrance conductors or as separate conductors. Service-entrance conductors shall not be installed within the hollow spaces of frame buildings unless provided with automatic over-current protection at their outer end.

Individual Conductors: Individual open conductors shall not be installed within 14 feet of the ground, except where specifically permitted to be less by the Buildings Engineer, but never less than 10 feet, nor where exposed to mechanical injury. They shall be supported on insulators, racks, brackets or other approved means, placed at intervals not exceeding 9 feet and separating the conductors at least 6 inches from each other and 2 inches from the surface wired over; or at intervals not exceeding 15 feet if they maintain the conductors at least 12 inches apart. For 300 volts or less, the separation between conductors may be reduced to not less than three inches where supports are placed at intervals not exceeding 4½ feet.

Raceways: Service raceways shall be equipped with a rain-tight service head and, where they are exposed to the weather, shall be made rain-tight and arranged to drain. Drip loops shall be formed on individual conductors where they enter a service head. Where service-entrance conductors are connected to a service drop above the service head, the insulation shall be removed for ½ inch at the lower part of the drip loop to provide drainage.

The inner end of the conduit or electrical metallic tubing shall enter a terminal box or cabinet, or be made up directly to an equivalent fitting, enclosing all live metal parts, except if the service disconnecting means is mounted on a switchboard having exposed bus-bars on the back, the raceway may be equipped with a bushing which shall be of the insulating type unless lead-covered conductors are used.

Disconnecting Means for Electric Services

Par. 8325. *General:* Each set of service-entrance conductors shall be provided with a readily accessible means of disconnecting all conductors from the source of supply. The disconnecting means shall consist of not more than six switches, or six manually-operable circuit-breakers, in a common enclosure, or in separate enclosures grouped at a readily accessible point nearest to the entrance of the conductors, either inside or outside the building wall. The disconnecting means shall be of a type approved for the prevailing conditions such as exposure to weather. In multiple tenancy buildings, each tenant shall have access to his disconnecting means.

If the switch or circuit-breaker does not interrupt the grounded conductor, other means shall be provided in the service cabinet or on the switchboard for disconnecting the grounded conductor from the interior wiring.

Location in Circuit: The disconnecting means shall control all circuits and devices, except that the service fuses, the meter, and high-impedance shunt circuits (such as potential coils of meters and control circuits of time switches) may be connected on the supply side of the disconnecting means. The wiring method for such a control circuit shall be one specified for service-entrance conductors.

Type of Disconnecting Means: The disconnecting means for ungrounded conductors shall be a switch or manually operable circuit-breaker of the air-break or oil-immersed type, equipped with a handle or lever for direct operation by the hand. A push-button type of electrical remote control may be used in addition to the manual handle.

It shall simultaneously disconnect all ungrounded conductors, except for 3-wire direct-current or single-phase circuits or multi-wire lighting circuits, and shall plainly indicate whether it is in the open or closed position.

Externally Operable: An enclosed service switch or circuit-breaker shall be externally operable and readily accessible unless additional enclosed, externally-operable switches or circuit-breakers are provided for control of all individual feeders and circuits supplied through it.

Rating of Service Switch: A service entrance switch shall have a rating not less than 30 amperes and not less than the current-carrying capacity of the size of service entrance conductors required.

Relative Location of Electric Service Equipment

Par. 8326. The overcurrent device shall protect all circuits and devices except as follows:

The service switch may be placed on the supply side.

High-impedance shunt circuits for measuring and control apparatus, such as potential coils of meters and control circuits of time switches, may be connected on the supply side of the service equipment.

Circuits used only for the operation of fire-alarm or other protective signaling systems may be connected on the supply side of the service overcurrent device when separately provided with overcurrent protection.

Circuits for emergency lighting may be connected on the supply side of the service overcurrent device when separately provided with overcurrent protection.

The meter may be placed on the supply side of the overcurrent device for alternating current supply not in excess of 300 volts between conductors, and provided the conductors between meter and service equipment are installed by any of the methods specified for service-entrance conductors.

Master Electric Services

Par. 8327. In a property comprising more than one building under single management, and which has a generating plant or is served by a master service, the conductors running from one building to another shall not be considered as service conductors; but the wiring in each building served shall be separately controlled and properly protected by overcurrent devices. The control should be a circuit-breaker or an enclosed externally-operable switch, which may be located in the building served or in another building, provided it is accessible to the persons using the installation.

Garages and outbuildings of residences come under this section.

Special Bonding Requirements for Electric Services

Par. 8328. *Bonding at Service Cabinet:* For overhead services the following shall be bonded together by means of bonding jumpers, clamps, or other devices (not locknuts and bushings) approved for the purpose:

The service raceways or service cable armor or sheath.

All service equipment enclosures containing service entrance conductors.

Any conduit, pipe, or armor which forms part of the grounding conductor to the service raceway.

Bonding in Service Run: When there are cabinets, meter fittings, boxes or gutters interposed in the service raceway or armor, or in the grounding conductor of the service raceway or armor, the electrical continuity of the system shall be assured by one of the following methods:

Threaded fittings with joints made up tight, where rigid conduit is involved.

Threadless fittings, made up tight, for electrical metallic tubing.

Bonding jumpers complying with the requirements of Paragraph 8649.

Other devices (not locknuts and bushings) approved for the purpose.

Where a service run of rigid metal raceway is interrupted by flexible metal conduit, the sections of rigid metal raceway thus interrupted shall be bonded together by a copper conductor not smaller than No. 8, using clamps or other approved means. The conductor and bonding devices shall be protected from mechanical injury. If the flexible conduit runs to the service cabinet, similar bonding shall be installed between the cabinet and the rigid raceway.

SECTION 833

INSTALLATION OF SWITCHES, SWITCHBOARDS, AND PANELBOARDS

General Requirements for the Installation of Switches

Par. 8330. No switch or circuit-breaker shall disconnect the grounded conductor of a circuit unless the switch or circuit-breaker simultaneously disconnects the ungrounded conductor or conductors, or unless the switch or circuit-breaker is so arranged that the grounded conductor cannot be disconnected until the ungrounded conductor or conductors have first been disconnected.

When a circuit-breaker serves as a switch it shall have the number of poles required for such switch.

Switches and circuit-breakers shall be accessible and, so far as possible, shall be grouped.

Approved methods shall be employed to prevent any uninsulated grounded conductor, as permitted in Paragraph 8313, from coming in contact with any conducting parts which are at other than ground potential.

Enclosures for Switches

Par. 8331. Switches and circuit-breakers, except pendent and surface type snap switches, unless of the oil-immersed type, shall be of the externally operable type enclosed in metal boxes or cabinets under any one of the following conditions:

Where the sparks or arcs produced during their operation can come in contact with readily ignitible material.

Where exposed to mechanical injury.

When operating at over 150 volts to ground and accessible to other than qualified persons.

Where exposed to moisture.

Enclosures shall be selected which have sufficient space to accommodate all conductors installed therein.

Where a switch or circuit-breaker is located in a wet place or outside of a building, it shall be enclosed in a weatherproof box or cabinet.

Time switches, flashers, and similar devices shall be enclosed in metal boxes or cabinets but need not be of the external operable type.

Special Requirements for the Installation of Knife Switches

Par. 8332. Single-throw knife switches shall be so placed that gravity will not tend to close them. Double-throw knife switches may be mounted so that the throw will be either vertical or horizontal as preferred, but where the throw is vertical, a locking device shall be provided which will insure the blades remaining in the open position when so set.

When practicable, knife switches shall be so connected that the blades will be dead when the switch is open.

Knife switches rated at more than 1200 amperes for switches of 250 volts or less, and at more than 600 amperes for switches of 251 to 600 volts, shall be installed only as isolating switches.

Special Requirements for the Installation of Snap Switches

Par. 8333. Snap switches used with open wiring on insulators shall be mounted on sub-bases of insulating material which will separate the conductors at least one-half inch from the surface wired over.

A snap switch having a "T" rating shall have a current rating not less than the rating of the total non-inductive load controlled by it, including tungsten lamps, tube lamps and their associated transformers. Snap switches used to control circuits supplying mercury-vapor and gas-tube lamps and their transformers shall be either of a type approved with the assembly or shall have a current rating not less than twice the rating of the lamps or transformers.

Installation of Three-Way and Four-Way Switches

Par. 8334. Three-way and four-way switches shall be classed as single-pole switches and shall be so wired that only one pole of the circuit is carried to the switch. Wiring between switches and outlets shall, where in metal enclosures, be run with both polarities in the same enclosure.

Scope of Requirements for Switchboards and Panelboards

Par. 8335. The requirements of Paragraphs 8335 to 8338, inclusive, shall apply to all switchboards, panelboards, and distribution boards used for the control of light and power circuits, except switchboards in utility company operated central stations and sub-stations which directly control energy derived from generators or transforming devices, and except switchboards or portions thereof used exclusively to control signal circuits operated by batteries. The requirements of these Paragraphs shall apply to battery-charging panels when current is taken from light or power circuits.

Switchboards and panelboards installed in the hazardous locations described in Section 840 shall comply with the requirements of that Section.

Location of Switchboards

Par. 8336. Switchboards which have any exposed live parts above 150 volts to ground, or live parts on ungrounded circuits exposed to voltages of more than 150 volts to ground, shall be located only where under competent supervision and accessible only to qualified persons.

Switchboards shall be so located that they will not be exposed to moisture and shall be so placed as to reduce to a minimum the probability of communicating fire to adjacent easily ignitible material.

The tops of switchboards shall be at least 3 feet below combustible ceilings. This space is not required when there are no arc-producing devices on the switchboard or when such devices are so designed and installed that the arc cannot constitute a fire hazard or when an adequate fireproof shield is provided between the board and the ceiling.

Where the equipment or wiring on the back of the switchboard is accessible only from the space behind the board, there shall be a clear space of at least 18 inches between such equipment or wiring and the wall for a single panel switchboard not exceeding 42 inches in width, and at least 24 inches when the board consists of more than one panel or is more than 42 inches wide. Where the space behind the board is accessible only from one end, these spaces shall be increased by at least 6 inches. Reduction of clearances for short intervals by building columns behind the switchboard, or by equipment on a single panel in the switchboard is permitted provided the clearances are not reduced below those required for a single panel board. The space back of the board shall be kept clear of foreign material and shall not be used for storage purposes.

General Requirements for the Installation of Switchboards

Par. 8337. Insulated conductors where closely grouped, as on the rear of switchboards, shall each have a flame-retardant outer covering. The conductor covering shall be stripped back a sufficient distance from the terminals so as not to make contact with them. Insulated conductors used for instruments and control wiring on the back of switchboards shall be flame-retardant, either inherently or by means of an outer covering, and shall be one of the following types: R, RP, RH, V, AVA, AVB, SN, or SNA.

When switchboards have live parts on the front that operate at a potential of more than 150 volts to ground, rubber mats or other suitable floor insulation shall be provided for the operator.

General Requirements for the Installation of Panelboards

Par. 8338. Panelboards shall be mounted in cabinets or cutout boxes and, where so located as to be exposed to excessive moisture, the enclosure shall be weatherproof.

Panelboards having switches on the load side of fuses shall not be installed except for use as service equipment as provided in Paragraph 8326.

The number of circuits of a lighting and appliance branch-circuit panelboard installed in any one cabinet or section of a cabinet having tight-fitting barriers shall not exceed 42 where one overcurrent device per circuit is used, or 20 where two overcurrent devices per circuit are used.

SECTION 834

INSTALLATION OF GENERATORS AND MOTORS

General Requirements for the Installation of Generators

Par. 8340. For the overcurrent protection and grounding of generators, refer to Chapters 85 and 86, respectively.

Generators shall be located in dry places. When they are installed in the locations described in Chapter 84, they shall comply with the requirements of that Chapter.

Each generator shall be provided with a name-plate giving the maker's name, the rating in kilowatts or kilo-volt-amperes, the normal volts and amperes corresponding to the rating, and the revolutions per minute.

The conductors from the generator terminals to the supplied equipment shall have a current-carrying capacity not less than 115 per cent of the nameplate current rating. Neutral conductors shall be the same size as the conductors of the outside legs.

Live parts of generators of more than 150 volts to ground shall not be exposed to accidental contact when accessible to unqualified persons.

Generators shall be provided with suitable drip pans when required by the Buildings Engineer.

General Requirements for the Installation of Motors

Par. 8341. For the overcurrent protection and grounding of motors, and for the installation of motors operating at more than 600 volts, refer to Chapters 85, 86 and 87, respectively. When motors are installed in the locations described in

Chapters 84, they shall comply with the requirements of that Chapter.

In locations where dust or flying material will collect on or in motors in such quantities as to seriously interfere with the ventilation or cooling of motors, and thereby cause dangerous temperatures, suitable types of enclosed motors which will not overheat under the prevailing conditions, shall be used. Under especially severe conditions enclosed pipe-ventilated motors, or an enclosure in separate dust-tight rooms, properly ventilated from a source of clean air shall be used.

A motor shall be provided with a name-plate which shall give the maker's name, the rating in volts and amperes, including those of the secondary if a wound-rotor type of motor, the normal full-load speed, and the interval during which it can operate starting cold, before reaching its rated temperature. The time interval shall be 5, 15, 30, or 60 minutes, or continuous. For alternating current motors rated as one-half horsepower or larger, except polyphase wound-rotor motors, the nameplate shall be marked with a code letter to show its input in kilovolt-amperes with locked rotor.

A controller shall be marked with the maker's name or identification symbol, the voltage, the current or horsepower rating, and such other data as may be needed to properly indicate the motors for which it is suitable.

Terminals of motors and controllers shall be suitably identified, as by marking or color, where necessary to indicate the proper connections.

Where the wiring to motors is in cables or raceways, junction boxes to house motor terminals shall be provided on the motors. These housings shall be of ample size to make connections properly and shall be of substantial construction. The cable or raceway shall be secured into the housing. When the motor has a rating of one-third horsepower or less, the junction box may be separated from the motor not more than 6 feet if the leads from the box to the motor are armored cables or are enclosed in flexible or rigid conduit, or electrical metallic tubing, not smaller than 3/8 inch electrical trade size.

All live parts of motors shall be protected in a manner judged adequate to the hazard involved. Exposed live parts of motors and controllers operating at 50 volts or more between terminals, except for stationary motors having commutators, collectors and brush rigging located inside of motor end brackets and not conductively connected to supply circuits operating at more than 150 volts to ground, shall be guarded against accidental contact by enclosure, or by location as follows:

By installation in a room or enclosure which is accessible only to qualified persons.

By installation on a suitable balcony, gallery or platform, so elevated and arranged as to exclude unqualified persons.

By elevation 8 feet or more above the floor.

So that it will be protected by a guard rail when the motor operates at 600 volts or less.

Motors shall be provided with suitable drip pans when required by the Buildings Engineer.

General Requirements for Motor Controllers

Par. 8342. All motors shall be provided with suitable controllers capable of starting and stopping them. The controller for an alernating-current motor shall be capable of interrupting the stalled-rotor current of the motor.

Each motor shall be provided with an individual controller, except that for motors of 600 volts or less a single controller may serve a group of motors under any one of the following conditions:

When a number of motors drive several parts of a single machine or piece of apparatus such as metal and woodworking machines, cranes, hoists, and similar apparatus.

When a group of motors is under the protection of one overcurrent device as permitted in Paragraph 8526.

When a group of motors is located in a single room within sight of the controller.

Adjustable-speed motors, if controlled by means of field regulation, shall be so equipped and connected that they cannot be started under weakened field, unless the motor is designed for such starting.

Separately-excited direct-current motors, series motors, or motor-generators and converters which can be driven at excessive speed from the direct-current end shall be provided with speed limiting devices unless the inherent characteristics of the machines, the system, or the load and the mechanical connection thereto are such as to safely limit the speed or unless the machine is always under the manual control of a qualified operator.

Rating and Type of Motor Controllers

Par. 8343. The controller shall have a horsepower rating which shall not be lower than the horsepower rating of the motor, except as follows:

For a stationary motor rated at one-eighth horsepower or less, that is normally left running and is so constructed that it cannot be damaged by overload or failure to start, such as clock motors and the like, the branch-circuit overcurrent device may serve as the controller.

For a stationary motor rated at 2 horsepower or less and 300 volts or less, the controller may be a general-use switch having an ampere rating at least twice the full-load current rating of the motor.

For a portable motor rated at one-quarter horsepower or less, the controller may be an attachment plug and receptacle.

A branch-circuit-type circuit-breaker, rated in amperes only, may be used as controller. When this circuit-breaker is also used for overcurrent protection, it shall conform to the appropriate provisions of Chapter 85 governing overcurrent protection.

Except when it serves also as a disconnecting means, as permitted in Paragraph 8346, the controller need not open all conductors to the motor. One pole of the controller may be placed in a permanently grounded conductor when the controller is so designed that the pole in the grounded conductor cannot be opened without simultaneously opening all conductors of the circuit.

The rating of a combination fuseholder and switch used as a motor-controller shall be such that the fuseholder will accommodate the size of fuse specified for motor-running protection in Paragraph 8060.

Location of Motor Controllers

Par. 8344. A controller shall be within sight of the motor controlled and its driven machinery unless one of the following conditions is complied with:

The controller or its disconnecting means is capable of being locked in the open position.

A manually-operable switch which will prevent the starting of the motor is placed within sight of the motor location. This switch may be placed in the remote-control circuit of a remote-control type of switch.

As otherwise specified in Section 840.

Special permission is given by the Buildings Engineer.

Remote-Control Circuits for Motors

Par. 8345. Control circuits for motors shall be so arranged that they will be disconnected from all sources of supply when the switch which disconnects the control device is in the open position except where a separate switch is used for the control circuit. When a transformer or other device is used to obtain a reduced voltage for control circuits, such transformer or other device shall be connected to the load side of the disconnecting means.

Where damage to a remote-control circuit would constitute a hazard, all conductors of such remote-control circuit shall be installed in conduit or be otherwise suitably protected from mechanical injury outside the control device itself.

For overcurrent protection of remote-control circuits, refer to Paragraph 8528.

General Requirements for Motor Disconnecting Means

Par. 8346. Each motor shall be provided with individual disconnecting means, except that for motors of 600 volts or less a single disconnecting means may serve a group of motors under any one of the following conditions:

When a number of motors drive several parts of a single machine or piece of apparatus such as metal and woodworking machines, cranes, hoists, and similar apparatus.

When a group of motors is under the protection of one set of overcurrent devices as permitted by Paragraph 8526.

When a group of motors is located in a single room within sight of the disconnecting means.

The disconnecting means serving a group of motors shall have a rating not less than is required by Par. 8347 for a single motor whose rating equals the sum of the horsepowers or currents of all the motors of the group.

A switch or circuit-breaker complying with the provisions of Paragraph 8343 may serve as both controller and disconnecting means if it opens all ungrounded conductors to the motor, is protected by an overcurrent device (which may be a set of fuses and which may be part of the controller assembly or may be separate) which opens all ungrounded conductors to the switch or circuit-breaker, and is of one of the following types:

An air-break switch, operable directly by applying the hand to a lever or handle.

A circuit-breaker operable directly by applying the hand to a lever or handle.

An oil switch of rating not more than 600 volts and 100 amperes; or exceeding 100 amperes if under expert supervision and by special permission of the Buildings Engineer. This switch shall be manually operable and may, in addition, be electrically operable.

A compensator type of controller is not included in the foregoing list and shall have a separate disconnecting means.

When an installation consists of a single motor, the service switch may serve as the disconnecting means, provided it conforms to the requirements of this Section, and is within sight of the controller.

Rating and Type of Motor Disconnecting Means.

Par. 8347. The disconnecting means for a motor shall be a switch or a circuit-breaker having a current carrying and interrupting capacity of at least 115 per cent of the full-load current rating of the motor, except as follows:

For stationary motors of one-eighth horespower or less, the branch-circuit overcurrent device may serve as the disconnecting means.

For stationary motors rated at more than 50 horsepower, the disconnecting means may be an isolating switch. Where such a switch is used, it shall be plainly marked "DO NOT OPEN UNDER LOAD."

For portable motors an attachment plug and receptacle may serve as the disconnecting means.

One pole of the disconnecting means may be placed in a permanently grounded conductor if the disconnecting means is so designed that the pole in the grounded conductor cannot be opened without simultaneously disconnecting all conductors of the circuit.

The disconnecting means shall plainly indicate whether it is in the open or closed position.

Location of Motor Disconnecting Means

Par. 8348. The disconnecting means shall be located within sight of the controller or shall be so designed and constructed that it can be locked in the open position.

The disconnecting means shall disconnect both the motor and the controller from all ungrounded supply conductors.

SECTION 835

INSTALLATION OF ELECTRICAL FIXTURES, RECEPTACLES AND ROSETTES

General Requirements for the Installation of Electrical Fixtures and Receptacles

Par. 8350. Electrical fixtures, lampholders, receptacles, and rosettes shall have no live parts normally exposed to contact.

except in the case of cleat-type lampholders, receptacles, and rosettes which are located at least eight feet above the floor.

Metal pull chains shall be provided with insulating links when they are within reach of bath tubs, shower baths, plumbing fixtures, steam piping, or other grounded metal work and ungrounded metal lighting fixtures, lampholders, and receptacles, including face plates, shall not be installed in such locations.

Fixtures that are recessed within a wall or ceiling shall be constructed and installed so that adjacent combustible material will not be subjected to temperatures in excess of 194 degrees Fahrenheit (90 degrees Centigrade). Recessed portions of enclosures, other than points of support, shall be spaced at least one-half inch from combustible material. Conductors with an insulation suitable for the temperature encountered shall be brought through at least four feet of metal raceway from the fixture to an outlet box which is at least one foot from the fixture. Conductors, unless approved for the purpose, shall not extend a distance of more than six feet from the fixture as measured along the raceway.

Lamps located in show windows or where liable to contact with inflammable material shall be installed in fixtures equipped with shades or guards or designed to operate at a safe temperature.

Ample air space shall be provided between a lamp and a shade or enclosure of inflammable material.

Fixtures and receptacles installed in the hazardous locations described in Section 840 shall conform to the requirements of that section.

Combination gas and electric fixtures shall not be installed.

Fusible rosettes shall not be installed.

Electrical Fixtures and Receptacles, Exposed to Moisture or Corrosive Vapors

Par. 8351. Electrical fixtures, lampholders, receptacles, and rosettes installed where they will be exposed to moisture or corrosive vapors shall be of the weatherproof type.

Pendent lampholders with permanently attached leads in such locations, when used in other than festoon wiring, shall be hung from separate stranded rubber-covered conductors which are soldered directly to the circuit conductors but supported independently of them. Such pendent conductors shall be not smaller than No. 14 for mogul or medium base lampholders nor smaller than No. 18 for intermediate or candelabra base lampholders, except for approved Christmas tree and decorative lighting outfits. Where the pendent conductors are longer than 3 feet, they shall be twisted together.

Supports for Electrical Fixtures, Receptacles and Rosettes

Par. 8352. Fixtures, lampholders, receptacles, and rosettes shall be securely supported. Where a gas pipe, outlet box, or other fitting which will provide proper support is required by this Code or is present, a fixture shall be attached thereto; otherwise a fixture shall be attached to a wooden base block not less than three-quarters inch in thickness, supported independently of the screws that support the fixtures.

Where a fixture is supported by a gas pipe, a bonding jumper shall be installed between the fixture and the outlet box unless the box is electrically connected to the gas pipe by other approved means.

Wiring of Fixtures

Par. 8353. Canopies and outlet boxes taken together shall provide ample space for conductors and their connecting devices.

Fixtures shall be so installed that the connections between the fixture conductors and the circuit conductors will be easily accessible for inspection without requiring the disconnecting of any portion of the wiring, unless the fixture is connected by means of a plugging device.

Lampholders, receptacles and switches having exposed terminals shall not be installed in metal fixture canopies or open bases of portable lamps. Exposed live parts within porcelain fixtures shall be suitably recessed and so located as to make it improbable that wires will come in contact with them. There shall be a spacing of at least one-half inch between live parts and the mounting plane of the fixture.

Splices and taps shall be made mechanically and electrically secure without solder and, unless made with an approved splicing device, shall then be soldered with a fusible metal or alloy. The joints shall be covered with an insulation equal to that on the conductors. No splice or tap shall be located within an arm or a stem. Splices and taps shall be accessible for inspection.

On chains or other movable parts stranded conductors shall be used unless the conductors are completely enclosed in metal. When the fixture is externally wired, conductors shall be secured in a manner which will not tend to cut or abrade the insulation, and shall be protected from abrasion where they pass through sheet-metal pans, canopies, and the like.

Chain fixtures shall be wired with flexible conductors so arranged that the weight of the fixture will not put tension on the conductor.

No lampholder suspended on a flexible cord nor any externally wired fixture other than of the chain type shall be placed in a show window.

Fixture conductors shall be not smaller than No. 18.

Fixtures equipped with mogul base lampholders shall be wired with Type AF fixture wire. Fixtures equipped with other than mogul base lampholders and operating at not more than 300 volts between conductors shall be wired with Type AF fixture wire or Type AFC, AFPO, or AFPD flexible cord when the conductors will be subjected to temperatures in excess of 194 degrees Fahrenheit (90 degrees Centigrade). When the conductors will not be subjected to such temperatures, such fixtures shall be wired with Type CF fixture wire or Type CFC, CFPD, or CFPO flexible cord and when the temperatures will not exceed 120 degrees Fahrenheit (49 degrees Centigrade) they may be wired with type RF-64, RF-32, FF-64, or FF-32 fixture wire, or with rubber-covered flexible cord.

Fixtures operating at more than 300 volts between conductors shall be wired with conductors having insulation equal to that on the circuit conductors.

Each fixture shall be so wired that all screw shells of lampholders are connected by means of a properly identified conductor to the identified circuit conductor.

Installation of Lampholders

Par. 8354. Lampholders, installed over highly flammable material shall be of the unswitched type and unless individual switches are provided, shall be located at least 8 feet above the floor, or shall be otherwise so located or guarded that the lamps cannot be readily backed out by hand.

Lampholders in clothes closets shall be installed on the ceiling or on the wall above the door. Drop cords shall not be installed in clothes closets.

Where used on unidentified 2-wire circuits tapped from the ungrounded conductors of multi-wire circuits, the switching devices of lampholders of the switched type shall disconnect both conductors of the circuit. Refer to Paragraph 8316.

Where a lampholder is attached to a flexible cord, the inlet shall be equipped with an insulating bushing which, if threaded, shall not be smaller than nominal three-eighth inch pipe size. The edges of the bushing shall be rounded and all inside fins removed in order to provide a smooth bearing surface for the conductors. Bushings having holes nine-thirty-seconds of an inch in diameter shall be used with plain pendent cord and holes thirteen-thirty-seconds of an inch in diameter with reinforced cord.

Receptacles of the screw-shell type shall be installed only for use as lampholders.

Where portable lamps, supplied through flexible cords, can come in contact with flammable material, the lampholder shall be equipped with a handle and substantial guard. The guard shall be attached to the lampholder or to the handle. Similar equipment shall be used to protect portable lamps from breakage.

Installation of Electrical Receptacles

Par. 8355. Receptacles installed for the attachment of portable cords shall be of a type not suitable for use with screw-shell-base devices.

Flush receptacles shall be enclosed in metal boxes in addition to the insulating enclosure of the receptacle mechanism. Flush receptacle plates, when of metal, shall be not less than 0.04 inches in thickness.

Attachment plugs and receptacles located in floors, except in dwellings with one apartment where they are mounted on seven-eighth inch mats, shall be enclosed in watertight floor boxes approved for the purpose.

SECTION 836

INSTALLATION OF TRANSFORMERS AND CONSTRUCTION OF VAULTS

Scope of Installation of Transformers

Par. 8360. This Section includes the requirements for the construction of transformer vaults and for the installation of transformers of all voltage, except as follows:

Transformers in hazardous locations shall comply with the requirements of this section except as modified by Section 840.

Transformers used for bell ringing or other signaling purposes which operate at a primary potential of not more than 250 volts shall comply with the requirements of Section 892.

Transformers used for signs and outline lighting shall comply with the requirements of Section 890.

Transformers used with radio equipment shall comply with the requirements of Paragraph 8814.

Transformers used for X-Ray or High-Frequency shall comply with the requirements of Section 884.

Transformers used with capacitors shall comply with the requirements of Paragraph 8373.

Special air-cooled transformers constituting a component part of other apparatus and control-circuit transformers furnished with control equipment shall comply with the requirements for the equipment of which they are a part.

General Requirements for the Installation of Transformers

Par. 8361. Transformers installed in buildings shall be located as near as is practicable to the point at which the supply conductors enter the building and so placed that fire and smoke from burning insulation or oil will be unlikely to do damage.

An air space of at least 6 inches shall be left between transformers and between transformers and adjacent surfaces.

Each transformer shall be provided with a name-plate giving the maker's name, the rating in kva, the primary and secondary voltage ratings, the frequency, and the liquid capacity in gallons when of the liquid-filled type. When an incombustible liquid is to be used, the liquid shall be specified.

Special Requirements for Auto-Transformers

Par. 8362. Transformers in which a part of the turns are common to both primary and secondary alternating-current circuits, ordinarily known as auto-transformers, may be connected to an interior wiring system only under one of the following circumstances:

> The system supplied contains an identified grounded conductor which is solidly connected to similar identified grounded conductor of the system supplying the auto-transformer.
>
> The auto-transformer is used for starting or controlling an induction motor.
>
> The auto-transformer supplies a circuit wholly within the apparatus which also contains the auto-transformer.
>
> The auto-transformer is used for fixed voltage adjustment on an existing unidentified power circuit.

The auto-transformer is used as a theater dimmer and is installed in accordance with Paragraph 8444.

Installation of Air-Cooled Transformers

Par. 8363. Air-cooled transformers shall be so constructed and installed that when mounted on a plane surface the casing will make contact with such a surface only at the points of support, providing elsewhere an air space of at least one-quarter inch between the casing and the surface. The enclosure of an air-cooled (natural draft) transformer shall be made of incombustible, moisture-resistant material.

Transformers whose windings are cooled by exposure to the air shall have a separation of at least 12 inches from combustible material, unless separated therefrom by a barrier of incombustible heat-insulating material or unless the transformers are rated at not more than 600 volts and are completely enclosed except for ventilating openings.

Installation of Transformers Containing a Combustible Liquid in Buildings

Par. 8364. Transformers filled with a combustible liquid shall be installed in a vault complying with the requirements of Paragraphs 8367 to 8369, inclusive, when installed in buildings other than generating station or sub-station buildings used for no other purpose except, with special permission of the Buildings Engineer, they may be installed as follows:

Transformers rated at not more than 600 volts and 10 kva may be installed without a vault in a building or room of any type of construction where there is no combustible material in the vicinity of the transformer.

Transformers rated at not more than 600 volts and not more than 25 kva in any one unit, or not more than 75 kva total rating, may be installed without a vault in a Type A, Fireproof, or Type B, Fire-resistant building, or a room enclosed by 2-hour fire-resistive construction, which contains no other combustible material in the vicinity of the transformer where the transformer is surrounded by concrete curbs not less than 6 inches high forming a basin of sufficient capacity to retain all the liquid used in the transformers.

Transformers with a total rating of not more than 75 kva may be installed in electric furnace rooms when they are surrounded by curbs as described in the preceding paragraph.

Installation of Transformers Containing an Incombustible Liquid in Buildings

Par. 8365. Transformers filled with an incombustible liquid shall be installed so as to be provided with mechanical protection, ventilation and inaccessibility to unauthorized persons. When they operate at more than 15,000 volts between terminals, they shall be installed in a vault complying with the requirements of Paragraphs 8367 to 8369, inclusive.

Transformers filled with such liquids and rated in excess of 25 kva shall be furnished with a pressure-relief vent which, where the transformer is installed in a poorly ventilated space, shall be connected to a chimney or flue that will carry the gases outside the building or the transformer shall be furnished with a means for absorbing any gases generated by arcing inside the case.

Installation of Transformers Outdoors

Par. 8366. Transformers containing a combustible liquid shall be attached to the exterior of a building or installed in immediate proximity thereto only when it is impracticable to locate them elsewhere. Where it is necessary to install them in such locations they shall be placed against blank masonry or other incombustible walls, away from wall openings and so as not to expose combustible attachments, such as eaves, cornices, or porches. When attached to a building they shall be separated from it by substantial supports.

Transformers and their associated equipment installed outdoors shall comply with the following:

They shall not be accessible to unauthorized persons.

They shall be so placed as not to interfere with firemen.

They shall be isolated with respect to combustibility, window exposure, and nature of occupancy of adjacent buildings.

Unless isolated by elevation they shall be surrounded by an enclosure, grounded when of metal, and placarded with a warning sign.

When transformers are filled with a combustible liquid, drains for overflowing liquid shall not come in close proximity to combustible structures or materials.

Transformers installed on the roof of a building shall be installed in a vault complying with the requirements of Paragraphs 8367 to 8369, inclusive, when they contain a combustible liquid. When the liquid is incombustible, the transformers shall not be mounted near doors and, when so located that leaking liquid might reach a window or door they shall be provided with a metal pan or concrete basin large enough to retain the liquid.

General Requirements for Transformer Vaults

Par. 8367. Transformer vaults shall be located as near as practicable to the point of entrance of the service conductors into the building. They shall be so located that they can be ventilated to the outside air without the use of ducts, wherever such an arrangement is practicable.

Vaults shall be of such size and design that an air space of not less than 6 inches is provided on every side of a transformer.

Pipes for water, steam, gas, sewers, or other purposes, and ducts for ventilating other parts of the buildings should not be installed in transformer vaults. Where conditions are such that the presence of such pipes cannot be entirely avoided, incombustible water-tight barriers shall be provided to prevent any leakage or moisture from condensation reaching high-voltage wiring or apparatus or the pipes shall be so located as to accomplish the same result. Such accessories as faucets, sprinkler heads, valves, or traps shall not be installed within the vault. Materials or equipment shall not be stored in transformer vaults.

Construction of Transformer Vaults

Par. 8368. The walls and roof of vaults shall consist of reinforced concrete not less than 6 inches in thickness or of brick not less than 8 inches in thickness, or of load-bearing hollow tile not less than 12 inches in thickness coated on the inside with cement plaster; except that when the total transformer capacity so enclosed is not more than 100 kva, reinforced concrete 4 inches thick may be employed. Where practicable, the outside walls of the building, when of standard vault construction, shall form one of the walls of the vault. The floor of the vault shall be of concrete at least four inches thick.

The vault shall be provided with a drain which will carry off any accumulation of oil or water that may collect in the vault. Floor and drain shall have a pitch of not less than one-quarter inch per foot. In vaults containing transformers having a total capacity of 100 kva or less, the drain may be omitted when the enclosure is so constructed as to retain all the oil used within the vault.

Openings in Transformer Vaults

Par. 8369. Transformer vaults shall be ventilated in such a manner as to prevent the room temperature from exceeding 40 degrees Centrigrade (104 degrees Fahrenheit). The thermometer shall be placed approximately one-half the height of the transformer above its base and approximately one-half the distance from the transformer to the wall but not more than 5 feet from the transformer. Ventilating openings shall be proportioned to the kva capacity of the transformers and be so located as to facilitate air movement. Where such openings are not connected to ducts or directly to the outside air they shall be provided with automatic dampers constructed of metal having a thickness of not less than No. 10 United States Standard gauge.

Openings for illumination or ventilation shall be protected by louvres or by substantial fixed metal screens with mesh not larger than three-fourths inch, and shall be so constructed that snow or rain will not reach wiring or apparatus of other than weatherproof construction. Openings for vault ventilation to the outside air shall be located as far away as practicable from doors, windows, and flammable material.

Any doorway leading from the vault into the building shall be provided with a tight-fitting Class A fire door, as described in Section 596. The Buildings Engineer may require such a door on each side of the wall when conditions warrant. Entrance doors shall be equipped with locks and the doors shall be kept locked, access to the vault being allowed only to authorized persons. Where spring or other automatic locks are used, they shall be so arranged that they may be readily and quickly opened from the inside.

A door sill of sufficient height to confine within the vault the oil from the largest transformer shall be provided but, in no case, shall the height of the sill be less than 4 inches.

SECTION 837

INSTALLATION OF CAPACITORS, RESISTORS AND REACTORS

Scope of Installation of Capacitors, Resistors and Reactors

Par. 8370. This Section includes the requirements for the installation of capacitors, resistors and reactors, except special capacitors constituting a component part of other apparatus and conforming with the requirements for such apparatus. Such equipment installed in hazardous locations shall comply with the requirements of this Section except as modified by Section 840.

General Requirements for the Installation of Capacitors.

Par. 8371. Capacitors shall be installed where they will not be exposed to mechanical injury and shall be enclosed in vaults complying with the requirements of Paragraphs 8367 to 8369 inclusive, unless one of the following conditions is complied with:

When the liquid is incombustible.

When the liquid is combustible, and there are no more than 3 gallons in each container and the containers are made liquid-tight without the use of solder, although solder may be used to prevent the slight seepage of liquid.

Capacitors not in vaults shall be enclosed in metal boxes or cabinets where exposed to combustible dust or flyings, or where they are in the vicinity of easily ignitible material.

All live parts of capacitors which are connected to circuits of more than 600 volts between conductors and which are accessible to unqualified persons shall be enclosed or isolated.

Capacitors shall be provided with a name-plate giving the maker's name, rated voltage, frequency, kva or amperes, number of phases, and when liquid-filled, the quantity and character of insulating liquid required. Capacitors and capacitor-transformer units used with individual alternating-current motors shall be marked in addition with an identification symbol, which symbol shall also appear on the nameplate of the motor with which the device is to be used.

Drainage of Stored Charge From Capacitors

Par. 8372. Capacitors shall be provided with a means of draining the stored charge to 50 volts or less within one minute after the capacitor is disconnected from the source of supply. Capacitors connected directly to other equipment without switch or over-current device interposed, will be considered as properly drained. When the drain or discharge circuit is not permanently connected to the terminals of the capacitor or capacitor bank, automatic means shall be provided for connecting the capacitor to the discharge circuit on removal of voltage from the line. Manual means of connecting the discharge circuit to the capacitor shall not be used.

Transformers Used With Capacitors

Par. 8373. Transformers for use with capacitors shall, except as herein provided, comply with the requirements of Section 836.

Transformers used exclusively in connection with capacitors may be installed without a vault when the following conditions are complied with:

They shall be located in rooms of incombustible construction and content.

They shall be protected against lightning disturbances.

They shall have sufficient capacity to allow for ordinary rise in voltage.

They shall be surrounded by concrete curbs not less than 6 inches high which form a basin of sufficient capacity to contain all the oil in the transformer.

They shall be controlled and have overcurrent protection with a rating or setting not exceeding twice the rated ampere capacity of the capacitor.

Electrical Installation Requirements for Capacitors

Par. 8374. Except as hereinafter provided for capacitors of not more than 100 kva associated with individual motors of not more than 100 horsepower, all capacitors used for power-factor correction shall be provided with overcurrent protection and a disconnecting means in each ungrounded conductor. The disconnecting means need not open all ungrounded conductors simultaneously and may be used for disconnecting the capacitor from the line as a regular operating procedure. Conductors supplying capacitors shall have a current-carrying capacity and the disconnecting means shall have a current-carrying capacity and interrupting capacity not less than the full-load current rating of the capacitors.

A capacitor of not more than 100 kva capacity associated with an individual motor of not more than 100 horsepower for power-factor correction and having a kva capacity not exceeding the horsepower rating of the motor may be connected at any point on the load side of the motor-circuit disconnecting means and motor-circuit overcurrent device. When the capacitor is connected in such a manner, the conductors supplying the capacitor shall be not smaller than those supplying the motor starter, the conductors to the motor need not be larger than required for the motor without the capacitor, no overcurrent device and no disconnecting switch need be connected in the capacitor circuit, and the over-current device and the switch in the motor circuit need not be of a rating greater than required for the motor without the capacitor.

General Requirements for the Installation of Resistors and Reactors

Par. 8375. Resistors and reactors shall be installed where they will not be exposed to mechanical injury and, when in the immediate vicinity of easily ignitible material, shall be of the oil-immersed type or shall be enclosed in metal boxes or cabinets.

Resistors and reactors shall be separated from combustible material by a distance of not less than one foot unless they are mounted as described in Paragraph 8376 or unless they are attached to a switchboard or other incombustible material.

Mounting of Resistors and Reactors

Par. 8376. Where resistors or reactors are installed within a distance of one foot from combustible material they shall be mounted on a slab or panel of incombustible, non-absorptive material such as slate, soapstone, or marble which shall extend beyond the edges of the device and shall have a thickness proportioned to the size and weight of the device but which shall be not less than one-half inch thick. The slab shall be secured in position by supports independent of those fastening the device to the slab. Bolts which fasten the device to the slab shall be countersunk at least one-eighth inch below the rear surface of the slab and shall be covered with insulating material.

Resistors and reactors shall be so constructed and installed that when mounted on a plane surface the casing will make contact with such a surface only at the points of support, providing elsewhere an air space of at least one-quarter inch between the casing and the surface.

Conductors Connected to Resistors

Par. 8377. When insulated conductors are used for connection between resistance elements and controllers, the conductors shall be asbestos covered (Type A), asbestos varnished cambric (Type AVA) or, for temperatures not exceeding 194 degrees Fahrenheit (90 degrees Centigrade), slow-burning (Type SB), except that for motor-starting service other conductor insulations may be used.

Incandescent Lamps As Resistors

Par. 8378. Incandescent lamps may be used as protective resistors for automatic controllers only or, by special permission of the Buildings Engineer, may be used as resistors in series with other devices.

The lamps shall be so arranged that they cannot have impressed upon them a voltage greater than that for which they are rated and they shall not carry or control the main current nor constitute the regulating resistance of the device. The lamps shall be mounted in porcelain receptacles on incombustible supports. A permanently attached name-plate giving the wattage and voltage of the lamp to be used in each receptacle shall be provided.

SECTION 838

INSTALLATION OF STORAGE BATTERIES

Scope of Installation of Storage Batteries

Par. 8380. The requirements of this Section shall apply to all stationary installations of storage batteries using acid or alkali as the electrolyte and consisting of a number of cells connected in series with a nominal voltage in excess of 16 volts.

Definition of Nominal Voltage

Par. 8381. The nominal battery voltage shall be calculated on the basis of 2.0 volts per cell for the lead-acid type and 1.2 volts per cell for the alkali type.

Insulation of Batteries of Not over 250 Volts

Par. 8382. Storage batteries having a nominal voltage not exceeding 250 volts shall comply with the following requirements:

Cells in lead-lined wood tanks, where the number of cells in series does not exceed 25, shall be supported individually on glass or glazed porcelain insulators. When the number of the cells in series exceeds 25, the cells shall be supported individually on oil insulators.

Cells of the alkali type in jars made of conducting material shall be installed in trays of non-conducting material, with not over 20 cells in a series circuit in any one such tray, or the cells may be supported singly or in groups on porcelain or other suitable insulators.

Cells in unsealed jars made of non-conductive material shall be assembled in trays of glass or supported on glass or glazed porcelain insulators; or, where installed on a rack, shall be supported singly or in groups on glass or other suitable insulators.

Cells in sealed rubber or composition containers shall require no additional insulating support when the total nominal voltage of all cells in series does not exceed 150 volts. When the total voltage exceeds 150 volts, batteries shall be sectionalized into groups of 150 volts or less and each group shall have the individual cells installed in trays or on racks. Where trays or racks are required for this type of cell, such trays or racks shall be supported on glass or glazed porcelain insulators or oil-type insulators.

Cells in sealed glass jars, with or without wood trays, require no additional insulation.

Insulation of Batteries of Over 250 volts

Par. 8383. Storage batteries having a nominal voltage exceeding 250 volts shall comply with the requirements of Paragraph 8382 and, in addition, the cells shall be installed in groups having a total nominal voltage of not over 250 volts in trays or on racks supported on oil insulators; except that where each individual cell, or sub-group in the tray or rack, is supported on oil insulators, no additional insulation for the group need be provided; and except that cells of not over 10 ampere-hour capacity in sealed glass jars may be grouped in trays, the total nominal voltage of all cells in such a group not to exceed 250 volts, and each such tray shall be supported on glass or glazed porcelain insulators, the trays being mounted on racks supported on oil insulators with a total nominal voltage of not over 500 volts for all cells in series on each such insulated rack.

Construction of Racks and Trays for Storage Batteries

Par. 8384. Racks for storage batteries shall be substantial and shall be made of wood or metal, either of which shall be so treated as to be resistant to the deteriorating action of the electrolyte, or shall be of other suitable construction. When of metal, they shall be provided with non-conducting supports for the battery.

Trays may be made of wood or other non-conductive material so treated as to be resistant to the deteriorating action of the electrolyte.

Required Battery Rooms

Par. 8385. Separate battery rooms or enclosures shall be required only for batteries in unsealed jars and tanks where the aggregate capacity at the eight-hour discharge rate exceeds five kilowatt hours.

Provision shall be made for sufficient diffusion and ventilation of the gases from the battery to prevent the accumulation of an explosive mixture in the battery room.

Wiring in Battery Rooms

Par. 8386. In storage battery rooms, bare conductors, open wiring, or conductors in rigid conduit or electrical metallic tubing shall be used as the wiring method.

Varnished-cambric-covered conductors, Type VC, shall not be used.

Bare conductors shall not be taped.

Rigid metal conduit, or electrical metallic tubing, where used, shall be of corrosion-resistant material or shall be suitably protected from corrosion.

Where metal raceway or other metallic covering is used in the battery room, at least 12 inches of the conductor at the end connected to a cell terminal shall be free from the raceway or metallic covering and shall be bushed by a substantial glazed insulating bushing. The end of the raceway shall be sealed tightly to resist the entrance of electrolyte by spray or by creepage. Sealing compound, rubber insulating tape or other suitable material shall be used for this purpose.

SECTION 839

ELECTRICAL APPLIANCES

General Requirements for the Installation of Electrical Appliances

Par. 8390. The requirements of this Chapter shall apply to electrical appliances used in any class of occupancy. When the installation of an appliance is covered by other Sections of this Code, the requirements of such Sections shall be considered as additional to or amendatory of the requirements of this Chapter. Motor-operated appliances shall conform to the requirements of Section 834.

An appliance shall be connected only to a receptacle or separable connector having a rating at least as great as the appliance.

Small portable appliances of 1650 watts or less for domestic purposes shall operate at a potential of less than 150 volts. Appliances rated at more than 1650 watts may be of higher voltage, in which case they shall be used on circuits of suitable design that comply with the requirements of Section 804.

Control and Protection of Electrical Appliances

Par. 8391. Each appliance shall be provided with a disconnecting means.

For the overcurrent protection of appliances, refer to Paragraph 8530.

The disconnecting means for an appliance shall be a switch, a separable connector or a plug and receptacle. For appliances rated at more than 1650 watts, the disconnecting means shall not be a part of the appliance and shall disconnect all ungrounded conductors.

Switches controlling the individual units of appliances shall not be considered as taking the place of the single disconnecting means required by this Paragraph.

A switch used as the disconnecting means shall be of the indicating type.

A plug used as the disconnecting means shall have no live parts exposed to contact when the circuit is broken.

The disconnecting means for appliances rated at more than 1650 watts shall be located as follows:

It shall be readily accessible to the operator of the appliance.

In other than dwelling occupancies it shall control only the appliance.

In multi-apartment (more than two) dwellings, the switch shall be within the apartment, or in the same story with the apartment in which the appliance is installed, and may control lamps and other appliances.

In two-apartment dwellings, the switch may be outside of the apartment in which the appliance is installed, but shall be readily accessible. This will permit an individual service switch for the apartment to be used where it is accessible to the user of the appliance.

In single-family dwellings the service switch may be used for this purpose.

The disconnecting means for a motor-driven appliance shall be within sight of the appliance or shall be so designed and constructed that it can be locked in the open position.

Installation of Electrically Heated Appliances

Par. 8392. Each electrically heated appliance that is obviously intended by size, weight and service to be located in a fixed position shall be so placed as to provide ample protection between the appliance and adjacent combustible material.

Each smoothing iron and other portable electrically heated appliance which is intended to be applied to combustible material shall be equipped with an approved stand, which may be a separate device or may be a part of the appliance.

In other than residence occupancies, each electrically-heated appliance, or group of electrically-heated appliances, intended to be applied to combustible material, shall be installed in connection with a signal unless the appliance is provided with an integral temperature-limiting device.

CHAPTER 84

INSTALLATION OF ELECTRICAL EQUIPMENT IN SPECIAL LOCATIONS

Sec. 840—Special Requirements for Electrical Equipment in Hazardous Locations.
Sec. 841—Special Requirements for Electrical Equipment in Garages.
Sec. 842—Special Requirements for Electrical Equipment in Motion-Picture Studios.
Sec. 843—Motion-Picture Projectors.
Sec. 844—Special Electrical Requirements for Public Assembly Buildings.
Sec. 845—Emergency Lighting Systems.
Sec. 846—Special Electrical Requirements for Cranes and Hoists.
Sec. 847—Special Electrical Wiring for Elevators.

SECTION 840

SPECIAL REQUIREMENTS FOR ELECTRICAL EQUIPMENT IN HAZARDOUS LOCATIONS

General Electrical Requirements in Hazardous Locations

Par. 8400. If the apparatus and wiring are installed in rooms or sections of the building in which the particular hazardous conditions described in this Section do not prevail, such wiring and apparatus may be of the type approved for such hazardous locations. For garages refer to Section 841.

Classification of Hazardous Locations

Par. 8401. Class I locations are those in which flammable volatile liquids, highly flammable gases, mixtures or other highly flammable substances are manufactured, used, handled or stored in other than their original containers.

Class I hazardous locations are divided into the following groups:

Group A—With atmospheres containing acetylene.

Group B—With atmospheres containing hydrogen or gases or vapors of equivalent hazard such as manufactured gas.

Group C—With atmospheres containing ethyl ether vapor

Group D—With atmospheres containing gasoline, petroleum, naphtha, alcohols, acetone, lacquer solvent vapors, or natural gas.

This class includes such locations as dry-cleaning or dry-dyeing plants, pyroxlin plastic manufacturing plants, spray-painting establishments, inflammable-gas plants, varnish-manufacturing plants, distillers, rectifying or blending plants producing whiskey or other alcoholic beverage liquors, plants producing industrial alcohol, or establishments or industries involving similar hazardous processes or conditions.

Class II locations are those in which combustible dust is thrown, or is likely to be thrown, into suspension in the air in sufficient quantities to produce explosive mixtures, or those where it is impracticable to prevent such combustible dust or metal dust from collecting in such quantities on or in motors, lamps, or other electrical devices that they are likely to become overheated because normal radiation is prevented.

Class II hazardous locations are divided into the following groups:

Group E—With atmospheres containing metal dust.

Group F—With atmospheres containing carbon black, coal or coke dust.

Group G—With atmospheres containing grain dust.

This class may include such locations as some parts of flour mills, feed mills, grain elevators, starch plants, sugar, cocoa and coal-pulverizing plants, and establishments or industries involving similar hazardous processes or conditions.

Class III locations are those in which easily ignitible fibers or materials producing combustible flyings are handled, manufactured or used, and which are hazardous through such fibers or flyings collecting on or being ignited by arcing contacts, resistors, lamps or similar apparatus. This class includes locations such as some parts of cotton and other textile mills, combustible-fibre manufacturing plants, cotton gins, clothing manufacturing plants, cotton-seed mills, woodworking plants and establishments or industries involving similar hazardous processes or conditions.

Class IV locations are those in which easily ignitible combustible fibers are stored or handled (except in rooms where in process of manufacture) and which are hazardous through such fibers being ignited by arcing contacts, resistors, lamps, or similar apparatus. This class includes locations such as warehouses in which are stored or handled combustible fibers such as cotton (including cotton linters and cotton waste), sisal or henequen, istle, jute, hemp, tow, cocoa fiber, oakum, baled waste, kapok, Spanish moss, excelsior, and other similarly readily ignitible fibers.

General Requirements for Electrical Equipment in Hazardous Locations

Par. 8402. *Special Precautions:* The intent of this section is to require a form of construction of equipment and of installation that will insure safe performance under conditions of proper use and maintenance. It is, therefore, required that more than ordinary care be exercised with regard to installation, maintenance, and use.

Live Parts: In hazardous locations, there shall be no exposed live parts except as permitted for electric cranes in Classes III and IV.

Flexible Cord: Where it is necessary to use portable lamps or portable appliances, flexible cord approved for hard usage, such as Type S, shall be used. Such a flexible cord shall contain one extra insulated conductor, which shall be properly connected to form a grounding connection for metal lamp guards, motor frames, and all other exposed metal portions of such portable lamps and appliances. The outer covering of the grounding conductor shall be finished to show a green color. Cords connected directly to supply conductors shall be securely supported so that the probability of a break in the conductors at this point will be minimized.

Electrical Equipment In Class I Hazardous Locations

Par. 8403. Where conditions are as described for Class I the following provisions shall be observed:

Wiring Method: Rigid conduit with threaded explosion-proof joints and fittings shall be employed as the wiring method; the joints shall have at least five full threads engaged. Where flexible connections are necessary, as at motor terminals, a flexible fitting of the explosion-proof type shall be used. At points where conduit terminates in an enclosure in which arcing or sparking is likely to occur such as at motor terminals, switch boxes, and the like, wherever a conduit leads from a hazardous to a non-hazardous location, and within two feet of terminal and junction boxes to which conduit runs four-inch size or larger are connected, the conduit shall be sealed off by the use of approved sealing fittings (unless the enclosure is provided with an approved means for sealing) and a sealing compound, approved for the purpose, which is not affected by the surrounding atmosphere or liquids and which has a melting point of not less than 200° F. The sealing compound shall have a thickness of not less than five-eighth inch. Where the seals are so located that there is a possibility of water, due to condensation or other causes, being trapped, the

the conduit system shall be so arranged that the water will collect in an explosion-proof sump which may be drained periodically. Splices shall not be made in fittings intended only for sealing purposes nor shall other fittings in which splices are made be filled with compound.

Service, Protective, and Control Equipment: Service equipment, panelboards, or switchboards shall not be placed in Class I locations unless it is impracticable to locate them elsewhere. Where installed in these locations, they shall be of a type approved for use in explosive atmospheres.

Circuit-breakers shall be of a type approved for use in explosive atmospheres. Fuses shall not be installed unless mounted within explosion-proof enclosures. The cutout bases and their enclosures shall be approved as unit devices for use in explosive atmospheres.

Devices or apparatus, such as motor controllers, thermal cutouts, switches, relays, the switches and contactors of autotransformer starters, resistance or impedance devices, which tend to create arcs, sparks, or high temperatures, shall not be installed unless such devices or apparatus are of a type approved for use in explosive atmospheres.

Lighting Equipment: Sufficient general illumination shall be provided by fixed lighting units to eliminate, so far as possible, any need for portable lamps.

Lamps and their lampholders in fixed positions shall be enclosed in a manner approved for explosive atmospheres and shall be properly protected by substantial metal guards or other approved means where exposed to mechanical injury. Lampholders shall be of the keyless type. Lighting fixtures shall not be of the pendent type unless supported by and supplied through hangers of rigid conduit, other metal tubing of equivalent thickness, or flexible connectors approved for explosive atmospheres. Rigidly mounted fixtures shall be strongly supported. Fixtures shall be wired with conductors not smaller than No. 14 in such a manner that no wires will be exposed. When rubber-covered conductors are used, the insulation shall be not less than 3/64 inch thick.

Portable lamps shall be enclosed in a manner approved for explosive atmospheres and shall be properly protected against breakage by approved types of guards. Lampholders for portable lamps shall be of molded-composition or other approved material and of the keyless type with no exposed metal parts.

Motors and Generators: Motors and generators shall be of types approved for use in explosive atmospheres.

Transformers and Capacitors: Transformers and capacitors containing a liquid that will burn, where located within buildings, shall be installed in a reinforced concrete vault conforming to the requirements of Paragraphs 8367 to 8369, inclusive. The vault shall be provided with ample ventilation to remove hazardous vapors, and with explosion relief ducts. All vents and ducts shall be of reinforced concrete and shall extend to a safe location outside the building. There shall be no openings from the vault to the interior of the building.

Where transformers and capacitors are located outside of the building proper, they shall be placed far enough away from explosive gases and vapors that a burnout will not ignite them. This requirement also applies to loading docks and tank farms.

Transformers and capacitors containing a liquid that will not burn may be located within the hazardous area provided they are enclosed in explosion-proof enclosures, or installed so as, in effect, to be removed from the hazardous location as by a room or vault enclosed by 2-hour fire-resistive construction, with unpierced walls or partitions to exclude the entrance of hazardous vapors, and provided with ample ventilation to outside air.

Receptacles and Attachment Plugs: Receptacles and attachment plugs shall be so constructed as a part of a unit device with an explosion-proof interlocking switch that the plug cannot be removed while the switch is in the "on" position, or approved devices in which the circuit is broken in an explosion-proof enclosure shall be used. Such receptacles and plugs shall be of the polarized type which provides a connection for the grounding conductor of the portable cord.

Electric Heating: Electric heating appliances shall be of a type approved for the particular location.

Electric Trucks: Electric trucks shall have wheels equipped with rubber tires or made of non-conducting material. The electrical equipment of trucks shall comply with the requirements of this Paragraph for similar stationary equipment.

Spray Booths: No motor, lamps, or lighting fixture of any type shall be located within spray booths, in ventilating ducts connected therewith, nor in any location where there is a possibility of the spray lodging upon them. The auxiliaries of mercury-vapor lamps shall be located at least ten feet from spray-booth working faces.

Motors in spray-painting establishments that are located outside of paint-spray booths and ventilating ducts and are judged by the Buildings Engineer to be outside of the hazardous area shall be of a standard totally-enclosed type or of the open induction type having no brushes, make-and-break contacts, collectors, or other arcing or sparking parts.

Signal and Communication Systems: All equipment of signalling and communication systems, irrespective of voltage, including bells, horns, sirens, relays, pushbuttons, and the like, shall be of a type approved for use in explosive atmospheres. All wiring for such systems shall be installed in accordance with the requirements of this paragraph for light and power wiring.

Electrical Equipment in Class II Hazardous Locations

Par. 8404. Where conditions are as described for Class II, the following provisions shall be observed:

Wiring Method: Rigid conduit with threaded joints shall be employed as the wiring method. Where flexible connections are necessary, as at motor terminals, a short length of flexible steel conduit may be used. Conduit boxes and other fittings used in locations where dusts are of an electrically conducting nature shall be of the dust-tight type.

Service, Protective, and Control Equipment: Service equipment, panelboards, or switchboards shall not be placed in these locations unless it is impracticable to locate them elsewhere. Where installed in these locations all live parts shall be enclosed in dust-tight metal cases or cabinets with provision for external operation only, or shall be placed in separate rooms built of or lined with substantial incombustible materials constructed so as to adequately exclude dust and having self-closing doors.

Overcurrent devices, whether fuses or circuit-breakers installed in Class II locations shall be enclosed in dust-tight metal cabinets or cases or shall be placed in separate rooms built as described above.

Devices or apparatus, such as motor controllers, thermal cutouts, switches, relays, switches and contactors of autotransformer starters, resistance and impedance devices, which tend to create arcs, sparks or high temperatures, if installed in locations of this class shall be enclosed within dust-tight cases or cabinets or be of the dust-tight type, and be so designed that the device may be operated without opening the cabinet or case.

Lighting Equipment: Sufficient general illumination shall be provided by fixed lighting units to eliminate, so far as possible, any need for portable lamps.

Lamps and their lampholders in fixed positions shall be enclosed in dust-tight fixtures so designed that in the event of a burnout of the lamp or lampholder no spark or hot metal can escape from the enclosure and, where exposed to mechanical injury, shall be properly protected by substantial metal guards or other approved means. Lampholders shall be of the keyless type. Lighting fixtures shall not be of the pendent type unless supported by and supplied through hangers of rigid conduit or other metal tubing of equivalent thickness. Rigidly mounted fixtures shall be strongly supported. Fixtures shall be wired with conductors not smaller than No. 14 in such a manner that no wires will be exposed. When rubber-covered conductors are used, the insulation shall be not less than 3/64 inch thick.

Portable lamps shall be enclosed in dust-tight globes properly protected against breakage by substantial metal or other approved types of guards. Lampholders for portable lamps shall be of molded-composition or other approved material and of the keyless type with no exposed metal parts.

Motors and Generators: Where explosive dusty atmospheres are likely to be present, motors or generators having brushes or sliding contacts shall have such brushes or sliding contacts enclosed in substantial dust-tight housings, or shall be of the totally-enclosed, totally-enclosed fan-cooled, or totally-enclosed pipe-ventilated type, or shall be enclosed in separate rooms or housings built of or lined with substantial incombustible materials, constructed so as to adequately exclude dust and properly ventilated from a source of clean air.

Where it is impracticable to prevent combustible dust from collecting in dangerous quantities on or in motors and generators, all motors and generators shall be of the totally enclosed, totally-enclosed fan-cooled, or totally-enclosed pipe-ventilated type, or shall be enclosed in separate rooms or housings built as described above.

Where motors and generators of the pipe-ventilated type are used, or where they are enclosed in rooms or housings, the vent pipes shall extend to the outside of the building to a source of clean air. The vent pipes shall be of metal, substantially constructed and with each section attached to the next by riveting, welding or other approved methods. The outer ends of vent pipes shall be suitably screened to prevent the entrance of animals or birds. If motors or generators are intended to be moved on their bases, a slip or universal joint, tight enough to prevent the entrance of dust, shall be provided in the vent pipes.

Motors and generators, regardless of type, in plants producing aluminum bronze powder shall preferably be located outside the dust-making buildings, but where installed within such buildings, they shall be of a type approved for such locations.

Transformers and Capacitors: Transformers and capacitors containing a liquid that will burn, where located within buildings, shall be installed in a reinforced concrete vault conforming to the requirements of Paragraphs 8367 to 8369, inclusive. The vault shall be provided with air cooling vents and pressure-relief openings of incombustible construction extended to the outside of the building. Any openings into the building shall be protected by two Class A fire doors.

Where transformers and capacitors are located outside the building proper, any combustible supports shall be at least ten feet horizontally from exposed combustible parts or unprotected openings of all buildings.

Transformers and capacitors containing a liquid that will not burn may be located within the hazardous area provided they are of dust-tight construction with dust-tight terminal enclosures, or are placed in dust-tight rooms enclosed by 2-hour fire-resistive construction. Such transformers shall be equipped with pressure relief devices.

In plants producing aluminum bronze powder, transformers and capacitors shall be installed outside of, and at a safe distance from, the dust-making buildings.

Receptacles and Attachment Plugs: Receptacles and attachment plugs shall be so constructed as a part of a unit device with a dust-tight interlocking switch that the plug cannot be removed while the switch is in the "on" position, or an approved device in which the circuit is broken in a dust-tight enclosure shall be used. Such receptacles and plugs shall be of the polarized type which provide a connection for the grounding conductor of the portable cord.

Electric Heating: Electric heating appliances shall be of a type approved for dusty atmospheres.

Electric Trucks: Electric trucks shall have wheels equipped with rubber tires or made of non-conducting material. The electrical equipment of trucks shall comply with the requirements of this Paragraph for similar stationary equipment.

Electrical Equipment In Classes III and IV Hazardous Locations

Par. 8405. Where conditions are as described for Classes III and IV, the following provisions shall be observed:

Wiring Method: Rigid conduit with threaded joints shall be employed as the wiring method, but locknuts and bushings may be used at boxes and cabinets. Where flexible connections are necessary, as at motor terminals, a short length of flexible steel conduit shall be used.

Service, Protective, and Control Equipment: Service equipment, panelboards, or switchboards shall not be placed in these locations unless it is impracticable to locate them elsewhere. Where installed in these locations all live parts shall be enclosed in dust-tight metal cases or cabinets with provision for external operation only, or shall be placed in separate rooms built of or lined with substantial incombustible materials constructed so as to exclude flyings or lint, and having self-closing doors.

Overcurrent devices, whether fuses or circuit-breakers, installed in Class III or Class IV locations shall be enclosed in dust-tight metal cabinets or cases or shall be placed in separate rooms built as described above.

Devices or apparatus, such as motor controllers, thermal cutouts, switches, relays, switches and contactors of auto-transformer starters, and resistance and impedance devices, which tend to create arcs, sparks or high temperatures, if installed in locations of these classes shall be enclosed within dust-tight cases or cabinets or be of the dust-tight type, and so designed that the device may be operated without opening the cabinet or case, or be placed in separate rooms built of or lined with substantial incombustible materials constructed so as to exclude flyings or lint and having self-closing doors. Enclosing cases shall be so built that ignition of flyings or lint by direct contact with the case, whether in normal operation or in event of accident, is avoided.

Lighting Equipment: Sufficient general illumination shall be provided by fixed lighting units to eliminate, so far as possible, any need for portable lamps.

Lamps and their lampholders in fixed positions shall be enclosed in dust-tight fixtures so designed that in the event of a burnout of the lamp or lampholder no spark or hot metal can escape from the enclosure and, where exposed to mechanical injury, shall be properly protected by substantial metal guards or other approved means. Lampholders shall be of the keyless type. Lighting fixtures shall not be of the pendent type unless supported by and supplied through hangers of rigid conduit or other metal tubing of equivalent thickness. Rigidly mounted fixtures shall be strongly supported. Fixtures shall be wired with conductors not smaller than No. 14 in such a manner that no wires will be exposed. When rubber-covered conductors are used, the insulation shall be not less than 3/64 inch thick.

Portable lamps shall be enclosed in dust-tight globes properly protected against breakage by substantial metal or other approved types of guards. Lampholders for portable lamps shall be of molded-composition or other approved material and of the keyless type with no exposed metal parts.

Motors and Generators: In Class III locations, where it is impracticable to prevent lint and flyings from collecting in dangerous quantities on or in motors or generators, as in cotton gins or the seed cleaning and linter rooms of cotton seed oil mills, all motors and generators shall be of the totally-enclosed, totally-enclosed fan-cooled, or totally-enclosed pipe-ventilated type, or shall be enclosed in separate rooms or housings built of or lined with substantial incombustible materials so constructed as to exclude lint or flyings and be properly ventilated from a source of clean air. Elsewhere in locations of this class, when motors or generators having brushes or sliding contacts are used, they shall:

Be of the totally-enclosed, totally-enclosed fan-cooled, or totally-enclosed pipe-ventilated type; or

Be enclosed in separate rooms or housings as specified above; or

Have brushes or sliding contacts enclosed in substantial tight metal housings.

In Class IV locations, motors and generators shall be of the totally-enclosed, totally-enclosed fan-cooled, or totally-enclosed pipe-ventilated type, or shall be enclosed in separate rooms or housings built as described above.

Where motors and generators of the pipe-ventilated type are used, or where they are enclosed in rooms or housings, the vent pipes shall extend to the outside of the building to a source of clean air. The vent pipes shall be of metal, substantially constructed and with each section attached to the next by riveting, welding or other approved methods. The outer ends of vent pipes shall be screened to prevent the entrance of animals or birds. If motors or generators are intended to be moved on their bases, a slip or universal joint, tight enough to prevent the entrance of flyings or lint, shall be provided in the vent pipes.

Transformers and Capacitors: Transformers and capacitors containing a liquid that will burn, where located within buildings, shall be installed in a reinforced concrete vault conforming to the requirements of Paragprahs 8367 to 8369, inclusive. The vault shall be provided with air cooling vents and pressure-relief openings of incombustible construction extended to the outside of the building.

Where transformers and capacitors are located outside the building proper, any combustible supports shall be at least ten feet horizontally from exposed combustible parts or unprotected openings of all buildings.

Transformers and capacitors containing a liquid that will not burn may be located within the hazardous area provided they are of dust-tight construction with dust-tight terminal enclosures, or are placed in dust-tight rooms enclosed by 2-hour fire-resistive construction. Such transformers shall be equipped with pressure relief devices.

Receptacles and Attachment Plugs: Receptacles and attachment plugs shall be of an approved type which confines any arc by means of a dust-tight enclosure. Such receptacles and plugs shall be of the polarized type that provides a connection for the grounding conductor of the flexible cord.

In lieu of the above attachment plugs and receptacles that are a part of a unit device with a dust-tight interlocking switch so constructed that the plug cannot be inserted or removed while the switch is in the "on" position may be used.

Electric Heating: Electric heating appliances shall be of a type approved for use where combustible flyings or lint are present.

Electric Trucks: Electric trucks shall have wheels equipped with rubber tires or made of non-conducting material. The electrical equipment of trucks shall comply with the requirements of this Paragraph for similar stationary equipment.

Electric Cranes: Electric cranes in Classes III and IV locations shall not be operated on a system with a grounded conductor. Feeders for electric cranes shall be provided with a recording ground detector and protected by a relay which will automatically open the feeder circuit-breaker in the event of the insulation resistance of the system falling below 1000 ohms. Bare conductors for cranes operating in these locations shall be protected by barriers so arranged as to prevent any escape of sparks or hot particles, and the moving current-collectors shall be so designed as to minimize sparking at sliding contacts.

Where cranes are supplied with current by means of insulated flexible conductors, the flexible conductors shall be Type S or Type PA and shall be provided with an approved type of reel or take-up device.

Grounding of Equipment in Hazardous Locations

Par. 8406. The exposed non-current-carrying metal parts of all equipment, both fixed and portable and irrespective of operating voltage, shall be grounded. The locknut-bushing and double-locknut types of contact shall not be depended upon for bonding boxes, cabinets, etc., to the raceway, but bonding jumpers with proper fittings or other approved means shall be used. Where flexible conduit is used as permitted in Paragraphs 8404 and 8405, bonding jumpers with proper fittings shall be provided around such flexible conduit.

SECTION 841

SPECIAL REQUIREMENTS FOR ELECTRICAL EQUIPMENT IN GARAGES

General Requirements for Electrical Equipment in Garages

Par. 8410. This section provides additional required precautions in the installation of electrical equipment in garages.

Live parts of equipment shall be guarded to prevent accidental contact.

Wiring Methods for Garages

Par. 8411. The wiring methods used in garages shall be metal conduit, electrical metallic tubing, surface metal raceways, wireways, or busways. Where a garage is not more than 600 square feet in area, armored cable or non-metallic sheathed cable may be used, with the restrictions given in Section 822, in addition to the methods listed.

For pendent lamps, reinforced cord, such as Types S, SJ, AFS and AFSJ, shall be used.

Type of Electrical Equipment in Garages

Par. 8412. Generators or motors having commutators, collector rings, or other make-and-break or sliding contacts, when located within 4 feet of the floor in a garage, shall be of the totally enclosed type. When such motors or generators are located 4 feet or more above the floor, they shall either be of the totally enclosed type or shall have wire screens or perforated metal with openings not exceeding 0.05 inch in one dimension enclosing the commutator or brush end of the motor or generator.

All other equipment which tends to produce arcs or sparks when in operation, such as controllers, switches, receptacles, cutouts, charging panels, fixed lampholders, etc., when located within 4 feet of the floor, shall be of a type approved for Class I Hazardous Locations as defined in Section 840.

Equipment installed in a showroom separated from the garage proper by a partition, or in a room or enclosure provided for the purpose, need not conform to the preceding requirements of this paragraph.

Portable Electric Cords and Appurtenances in Garages

Par. 8413. Flexible cords supplying portable lamps, motors, or other appliances in garages shall be Type S and shall have an identified conductor. Receptacles, attachment plugs, connectors, and similar devices shall be of the polarized type, the male part being on the cord connected to the appliance and the female part being of such design or so hung that the connector will break apart readily at any position of the cable. Connectors shall be kept at least 4 feet above the floor.

Portable Electric Lamps in Garages

Par. 8414. Portable lamps in garages shall be equipped with handle, lampholder, hook and a substantial guard attached to the lampholder or to the handle. Lampholders shall be of molded composition or other approved material and of the keyless type. Brass shell paper-lined lampholders shall not be used.

The identified conductors of flexible cords shall be connected to the screw shells of the lampholders.

Battery Charging Cables and Appurtenances in Garages

Par. 8415. For battery charging purposes Type S cord shall be used in garages.

Connectors shall have a rating of at least 50 amperes and shall be so designed or so hung that at least one will break apart readily at any position of the charging cable. All live parts shall be guarded from accidental contact. Where plugs for direct connection to vehicles are suspended from overhead wiring, they shall hang at least 6 inches above the floor and and no connector need be placed in the cable or at the outlet.

SECTION 842

SPECIAL REQUIREMENTS FOR ELECTRICAL EQUIPMENT IN MOTION-PICTURE STUDIOS

Scope of Electrical Requirements in Motion-Picture Studios

Par. 8420. The requirements of this Section shall apply to motion-picture studios, exchanges, factories and laboratories and to that building or portion of a building in which motion-picture films are manufactured, exposed, developed, printed, rewound, repaired or stored. This Section shall not apply where only approved slow-burning (cellulose acetate or equivalent) film is used.

General Requirements for Electrical Equipment in Motion-Picture Studios

Par. 8421. Live parts of equipment in motion-picture studios shall be enclosed to prevent accidental contact by persons or objects.

Switches shall be of the externally operable type. Rheostats shall be enclosed and externally operable.

Motors shall not be installed in film-storage vaults.

Wiring Methods In Motion-Picture Studios

Par. 8422. The wiring method in motion-picture studios shall be rigid metal conduit or other approved type of metal raceway. Portable cables or flexible cord may be used on studio stages and at other locations where fixed wiring methods are impracticable.

Fixed Lighting Equipment In Motion-Picture Studios

Par. 8423. Pendent lamps in motion-picture studios shall be suspended by means of reinforced cords, armored cord, or armored cable and shall be protected by lamp guards.

Side-wall lamp outlets shall consist of lampholders mounted in outlet boxes and equipped with open-end guards riveted to the cover of the box.

At patching tables, composition or metal-sheathed porcelain keyless lampholders shall be employed and shall be equipped with guards to protect the lamps from mechanical injury.

In film-storage vaults lamps shall be installed on rigid fixtures and enclosed in vapor-tight globes. Lamps shall be controlled by a double-pole switch located outside the vault.

Portable Electric Lamps In Motion-Picture Studios

Par. 8424. For portable lamps, in motion-picture studios, composition or metal-sheathed porcelain keyless lampholders shall be used which shall be provided with guards, hooks, and handles. These provisions shall not apply to portable lamps used as properties in a motion-picture set on a studio stage or similar location.

Portable lamps shall not be used in film-storage vaults.

Portable Electric Cords and Appurtenances In Motion-Picture Studios

Par. 8425. Flexible cords supplying portable lamps or other equipment shall be Type S in motion-picture studios, except that portable lamps used as stage properties in a motion-picture set on a studio stage or similar location may be used with any approved type of cord with which they may be equipped.

The cord shall carry the male part of a pin-plug connector or equivalent, the female part being of such design or so hung that the connector will readily break apart at any position of the cord. The connector shall be kept at least 1 foot from the floor.

Motors and Generators In Motion-Picture Studios

Par. 8426. When motors or generators having brushes or sliding contacts are used in motion-picture studios, they shall meet one of the following conditions:

Be of the totally-enclosed, enclosed-fan-cooled, or enclosed-pipe-ventilated types.

Be enclosed in separate rooms or housings built of incombustible materials so constructed as to exclude flyings or lint, and properly ventilated from a source of clean air.

Have brush or sliding-contact end of motor enclosed by solid metal covers.

Have brushes or sliding contacts enclosed in substantial, tight, metal housings.

Have the upper half of brush or sliding-contact end of the motor enclosed by a wire screen or perforated metal and the lower half enclosed by solid metal covers.

Have wire screens or perforated metal placed at the commutator or brush ends. No dimension of any opening in the wire screen or perforated metal shall exceed 0.05 inch, regardless of the shape of the opening and of the material used.

These provisions shall not apply to motors or generators used on studio stages, but the live parts of such motors or generators shall be otherwise guarded or enclosed in conformity with the requirements of Paragraph 8421.

Sound Recording in Motion-Picture Studios

Par. 8427. Installations for sound recording in motion-picture studios shall conform to the provisions of Section 880.

SECTION 843

MOTION-PICTURE PROJECTORS

Scope of Motion-Picture Projectors

Par. 8430. This section includes the classification and installation of motion-picture projectors and their auxiliary equipment.

Sound recording and reproducing equipment shall comply with the requirements of Section 880.

Classification of Motion-Picture Projectors

Par. 8431. Motion-Picture projectors are classified into professional type and non-professional type. The professional type employes a film 35 millimeters (1⅜ inches) wide with 5.4 perforations per inch on each edge. The non-professional type employs a narrower film of an approved slow-burning (cellulose acetate or equivalent) type, having a permanent, distinctive marker for its entire length, identifying the manufacturer and the slow-burning character of the film stock.

Professional Motion-Picture Projectors

Par. 8432. The professional type of motion-picture projector, such as is commonly used in theatres and motion-picture houses, shall be installed in an enclosure complying with the requirements of Paragraph 4162. Such an enclosure shall not be considered as a Hazardous Location, as defined in Section 840.

Motion-picture projectors of the professional type and their associated enclosures for arc or incandescent lamps, rectifiers, transformers, rheostats, and similar equipment, shall be of approved types. When the projector is motor-driven, it shall be either of a type expressly designed and approved as an assembly for such operation, or it shall consist of an approved projector, an approved projector lamp, and a motor so designed or guarded as to prevent ignition of film by sparks or arcs.

The projectors and their auxiliary equipment shall be marked with the name or trademark of the maker and with the voltage and current for which they are designed.

Non-Professional Motion-Picture Projectors

Par. 8433. Projectors of the non-professional or miniature type employing only approved slow-burning (cellulose acetate or equivalent) film, may be operated without a booth.

Motion-picture projectors of the non-professional type, their lamp enclosures, current-controlling and other auxiliary devices, shall be approved as component parts of the projector equipment. The source of illumination shall be a lamp of a type approved for stereopticon use or for motion-picture projection. Projectors shall be marked with the name or trademark of the maker, with the current and voltage for which they are designed, and with the wording "For use with slow-burning films only."

The slow-burning (cellulose acetate or equivalent) film used shall have a permanent distinctive marker for its entire length identifying the manufacturer and the slow-burning character of the film stock.

Wiring for Motion-Picture Projectors

Par. 8434. Conductors supplying outlets for projectors of the professional type shall not be smaller than No. 8 and shall be of sufficient size for the projector employed.

Asbestos-covered conductors (Type A) shall be used on arc lamps and other equipment where the ambient temperature at the conductor as installed will exceed 120 degrees Fahrenheit (49 degrees Centrigrade).

Hard service cords, Types K, S, or SJ shall be used on portable equipment.

Incandescent lamps in projection rooms or booths shall be provided with an approved lamp guard unless otherwise protected by incombustible shades or other enclosures.

Location of Auxiliary Equipment for Projectors

Par. 8435. Motor-generator sets, transformers, rectifiers, rheostats, and similar equipment, for the supply or control of current to arc lamps on projectors shall, if practicable, be located in separate rooms. Where placed in the projector room, they shall be so located or guarded that arcs or sparks cannot come in contact with film, and motor-generator sets shall have the commutator end or ends protected as provided in Paragraph 8426.

SECTION 844

SPECIAL ELECTRICAL REQUIREMENTS FOR PUBLIC ASSEMBLY BUILDINGS

Scope of Electrical Requirements for Public Assembly Buildings

Par. 8440. This Section includes the requirements for the construction and installation of theatrical electrical equipment and the special requirements, additional to those of other applicable sections of Part VIII, for the installation of other electrical equipment in Public Assembly Buildings.

Motion-picture projectors and sound reproducing equipment shall comply with the requirements of Sections 843 and 880, respectively.

Control of Lighting in Public Assembly Buildings

Par. 8441. The auditorium lighting shall be so arranged that it can be turned on from a room connected with the lobby, the lobby, or the rear wall of the main floor of the auditorium, irrespective of the position of any other control for these lights.

The lighting of the stage and of all other spaces and rooms behind the proscenium wall shall be controlled from the stage. The lighting of the individual spaces and rooms shall also be controlled locally.

The lighting of vestibules, lobbies, foyers, passageways, stairways, exits, and all rooms communicating therewith shall be controlled by a switch in a room connected with the lobby and such lighting shall be controlled only from such location.

Emergency Lighting In Public Assembly Buildings

Par. 8442. In Public Assembly Buildings, the exit sign lights and selected lamps in foyers, stairways, corridors and other paths of exit, sufficient to provide illumination for egress of the audience, shall be wired on an emergency lighting circuit installed in accordance with Section 845. These lights shall be known as the emergency lights and shall be kept lighted whenever there is an audience in the building. The emergency lights may also include lights on switchboards, in projection rooms, and at other critical points.

Wiring In Public Assembly Buildings

Par. 8443. In Public Assembly Buildings the wiring method shall be metal conduit or other approved metal raceway system, except as provided in Sections 880 and 892. Portable cables or flexible cords may be used on the stage or elsewhere when fixed wiring methods are impracticable.

Pendent lamps shall not be installed in dressing rooms. All incandescent lamps in dressing rooms, where less than eight feet from the floor, shall be equipped with open-end guards riveted to the outlet box cover or otherwise sealed or locked in place.

Stage Switchboards

Par. 8444. Stage switchboards shall be of the dead-front type.

Stage switchboards having exposed live parts on the back shall be enclosed by the building walls, by grilles of No. 10 (American Steel Wire Gauge) wire, having a mesh of not more than 1½ inches, or by partitions of incombustible material. The entrance to this enclosure shall be by means of a self-closing door. The front of the switchboard shall be protected by a railing not less than 3 feet high. A metal hood extending the full length of the switchboard shall be provided to protect all equipment on the board from falling objects.

Means shall be provided at the stage switchboard for the control and individual overcurrent protection of branch circuits to stage and gallery receptacles. Dimmers on stage switchboards shall be so connected that they will be dead when their respective circuit switches are open. Resistance or series reactor type dimmers which do not open the circuit may be placed in a grounded neutral conductor. An autotransformer type dimmer shall be energized by a circuit operating at not more than 150 volts between conductors, and one conductor shall be connected to the required identified grounded conductor of the wiring system.

Installation of Fixed Electrical Stage Equipment

Par. 8445. Circuit Loads: Footlights, border lights, and proscenium side lights shall be so connected that no branch circuit supplying such equipment will carry a load exceeding 15 amperes; provided that where heavy-duty lampholders only are used for border lights, such circuits may conform to the provisions of Section 804 for circuits supplying heavy-duty lampholders.

Footlights: When the metal trough construction specified in Paragraph 8447 is not used, footlights shall consist of individual outlets with lampholders, wired with rigid or flexible metal conduit. The circuit conductors shall be soldered to the lampholder terminals. Disappearing footlights shall be so arranged that the current supply shall be automatically disconnected when the footlights are replaced in the recess designed therefor.

Cables for Border Lights: Cables for border lights shall be Type K or Type S flexible cord. The cables shall be suitably supported. Such cables shall be employed only where flexible conductors are necessary.

Receptacles: Receptacles intended for the connection of arc lamps shall have not less than 35 amperes capacity and shall be supplied by conductors not smaller than No. 6. Receptacles intended for the connection of incandescent lamps shall have not less than 15 amperes capacity and shall be supplied by conductors not smaller than No. 12. Plugs for arc and incandescent receptacles shall not be interchangeable.

Lamps in Scene Docks: Lamps installed in scene docks shall be so located and guarded as to be free from mechanical injury and as to provide an air space of not less than 2 inches between such lamps and any combustible material.

Curtain Motors: Curtain motors having brushes or sliding contacts shall comply with the requirements of Paragraph 8426.

Stage Ventilator Control: When stage ventilators are released by an electrical device, the circuit operating the latter shall be normally closed and shall be controlled by at least 2 single-pole switches enclosed in iron boxes having self-closing doors without locks or latches, one switch being placed at the electrician's station and the other where designated by the Buildings Engineer. The device shall be designed for the full voltage of the circuit to which it is connected, no resistance being inserted. It shall be located in the loft above the scenery and shall be enclosed in a suitable iron box having a tight, self-closing door.

Installation of Portabe Electrical Stage Equipment

Par. 8446. *Arc Lamps:* Arc-lamp frames and standards on stages shall be so installed and guarded as to prevent their becoming grounded. A qualified operator shall be employed for each lamp or for each 2 lamps not more than 10 feet apart and so placed that one operator can properly watch and care for both.

Lights on Scenery: Brackets on scenery shall be wired internally, and the fixture stem shall be carried through to the back of the scenery where a bushing shall be placed on the end of the stem, except that externally wired brackets or other fixtures may be used when wired with Type P or other cords designed for hard usage which shall extend through scenery.

are without joint or splice in the canopy of fixture back, and terminate in an approved type stage connector located within 18 inches of the fixture. Fixtures shall be securely fastened in place.

Festoons: Joints in festoon wiring shall be staggered where practicable. Lamps enclosed in lanterns or similar devices of combustible material shall be equipped with approved guards.

Special Effects: Electrical devices used fir simulating lightning, waterfalls, and the like, shall be so constructed and located that flames, sparks, or hot particles, cannot come in contact with combustible material.

Connectors for Flexible Conductors: Conductors for flexible conductors shall be so constructed that tension on the cord or cable will not be transmitted to the connections. The female half of the connector shall be attached to the live end of the cord or cable.

Conductors for Portables: Flexible conductors used to supply portable stage equipment shall be Type K or Type S cord, except that reinforced cord may be used to supply stand lamps if the cord is not liable to severe mechanical injury and is protected by a fuse rated at not over 15 amperes.

Construction of Theatrical Lighting Equipment

Par. 8447. *Footlights:* When metal trough construction is employed for footlights, the trough containing the circuit conductors shall be made of sheet metal not lighter than 20 U. S. sheet metal gauge (0.0375 inch in thickness) treated to prevent oxidation. Lampholder terminals shall be kept at least one-half inch from the metal of the trough. The circuit conductors shall be soldered to the lampholder terminals.

Borders and Proscenium Sidelights: Borders and proscenium sidelights shall be constructed as prescribed for footlights, shall be suitably stayed and supported, and shall be so designed that the flanges of the reflectors or other adequate guards will protect the lamps from mechanical injury and from accidental contact with scenery or other combustible material. Borders shall be wired with asbestos-covered, Type A, asbestos varnished-cambric, Type AVA and AVB, or, where the temperature does not exceed 194 degrees Fahrenheit (90 degrees Centigrade), slow-burning, Type SB, conductors.

Portable Strips: Portable strips shall be constructed in accordance with the requirements for border lights and proscenium side lights. The supply cable shall be protected by bushings where it passes through metal and shall be so arranged that tension on the cable will not be transmitted to the connections.

Pockets: Receptacles intended for the connection of portable lighting equipment shall be mounted in suitable pockets or enclosures, and shall comply with the requirements of Paragraph 8445.

Arc Lamps: Portable arc lamps shall be substantially constructed entirely of metal not less than No. 20 U. S. sheet metal gauge (0.0375 inch) except where approved insulating material is necessary. The design shall be such as to provide proper ventilation while retaining sparks, and to prevent carbons or other live parts of lamp from making contact with metal or hood. Mica shall be used for the insulation of the lamp frame.

Hoods for other than lens lamps shall have the front opening equipped with a self-closing hinged door frame carrying either wire gauze or glass. Hoods for lens lamps may have a stationary front, and a solid door on either back or side.

The switch on the standard shall be of such design that accidental contact with any live part will be impossible.

Rheostats shall be enclosed in a substantial, properly ventilated metal case affording a clearance of at least one inch between case and resistance element. When the rheostat is mounted on the standard, a clearance of 3 inches above the floor shall be maintained.

When stranded conductors are used, they shall be connected to lamp, rheostat and switch terminals by means of approved lugs or connectors, except that approved solderless lugs shall be used at arc lamp terminals.

Portable Plugging Boxes: Portable plugging boxes shall be so constructed that no current-carrying part will be exposed. Each receptacle shall have a current-carrying capacity of at least 30 amperes, and shall be protected by overcurrent devices enclosed in an approved cabinet equipped with self-closing doors. Busbars shall have a current-carrying capacity equal to the sum of the ampere ratings of all the receptacles. Lugs shall be provided for the connecting of the master cable.

Portable Switchboards on Stage

Par. 8448. *Current Supply:* Portable switchboards on stages shall be supplied only from outlets especially provided for this purpose. Such outlets shall consist of externally operable, enclosed fused switches or circuit-breakers mounted on the stage wall or at the switchboard in locations readily accessible from the stage floor.

The supply to a portable switchboard shall be by means of a stage cable having sufficient capacity to carry the total load on the switchboard and the fuses at the point of supply shall be of a rating that will protect the cable.

Branch Circuit Protection: Circuits from portable switchboards directly supplying apparatus containing incandescent lamps shall be provided with overcurrent devices rated or set at not over 15 amperes. Other circuits shall be provided with overcurrent devices with a rating or setting not higher than the current required by the connected load.

Construction: Portable switchboards for use on stages shall be placed within an enclosure of substantial construction which may be so arranged that the enclosure is open during operation. Enclosures of wood shall be completely lined with sheet metal of not less than No. 24 United States Standard gauge (0.0239 inch), and when not of corrosion-resistant type shall be well galvanized, enamelled, or otherwise properly coated to prevent corrosion.

Except as provided for dimmer face plates, there shall be no exposed live parts within the enclosure.

Enclosures shall be provided for all overcurrent devices in addition to the switchboard enclosure.

All switches shall be of the externally-operable, enclosed type.

The terminals of dimmers shall be provided with enclosures, and dimmer face plates shall be so arranged that accidental contact cannot be readily made with the face-plate contacts.

A pilot light shall be provided within the enclosure and shall be so connected to the circuit supplying the board that the opening of the master switch will not cut off the supply to the lamp. This lamp shall be on an independent circuit having overcurrent protection rated or set at not over 15 amperes.

The supply cable shall be a Type K or Type S flexible cord terminating within the switchboard enclosure or in an enclosed, externally operable, fused master switch, or circuit-breaker. The supply cable shall have sufficient current-carrying capacity to carry the total load on the switchboard and shall be protected by overcurrent devices.

All conductors within the switchboard enclosure shall be stranded and, except for cables feeding to or from the switchboard, shall be asbestos-covered, Type A. Each conductor shall have a carrying capacity at least equal to the rating of the circuit-breaker, switch or cutout base which it supplies, except for conductors for incandescent lamp circuits having overcurrent protection not exceeding 15 amperes. Conductors shall be enclosed in metal troughs or securely fastened in position and shall be bushed where they pass through metal. At terminals No. 6 and larger conductors shall be soldered into lugs, and strands of smaller conductors shall be soldered together where connected by means of clamps or binding screws.

Cables shall be protected by bushings where they pass through enclosures and shall be so arranged that tension on the cable will not be transmitted to the connections.

Terminals to which stage cables are connected shall be so located as to permit convenient access to the terminals. When terminals are not provided with approved solderless connectors, solder lugs shall be used on conductors of No. 6 or larger and the strands of conductors smaller than No. 6 shall be soldered together when connected to clamps or binding screws not specifically approved as solderless connectors.

SECTION 845

EMERGENCY LIGHTING SYSTEMS

Scope of Requirements for Emergency Lighting Systems

Par. 8450. The provisions of this Section are special requirements, additional to the requirements of other applicable sections of Part VIII, for the installation of Emergency Lighting Systems in Public Assembly Buildings, as required by Paragraph 8442.

Current Supply for Emergency Lighting Systems

Par. 8451. The current supply for Emergency Lighting Systems shall be from at least two separate and independent sources, and may comprise any one of the following:

Two separate and independent services from the outside.

One service, and a storage battery of sufficient capacity to supply and maintain, at not less than 91 per cent full voltage, the total load of the circuits carrying lights for emergency illumination for a period of at least one-half hour. Automobile batteries, or lead batteries of other than the sealed, glass-jar type, shall not be used for such purpose.

One service and a generator set, driven by some form of prime mover and of capacity sufficient to supply circuits carrying emergency illumination load, with suitable means for automatically starting the generator on failure of the normal service.

Derangement Signals for Emergency Lighting Systems

Par. 8452. Audible and visual signal devices shall be provided, where possible, to give warning of derangement of emergency illumination current sources jeopardizing their proper functioning, and to indicate when batteries or generator sets are carrying the emergency illumination load.

Control of Emergency Lighting Systems

Par. 8453. Circuits for emergency illumination shall be controlled through one switch accessible only to authorized persons and shall be located preferably in a room connected with the lobby, or at a place convenient to the main entrance to the building, except that in addition to such a switch, there may be:

A switch at the main service or on the control panel of a special current source.

A switch located adjacent to the emergency switch, or an automatic light-actuated device approved for the purpose, to control separately those lights on the exterior of the building which are not required for illumination when there is sufficient daylight.

Emergency circuits shall not be connected to or controlled by a stage lighting control.

Installation Requirements for Emergency Lighting Systems

Par. 8454. Emergency lights shall be provided and so located and supplied as to provide, with one supply interrupted, emergency illumination without appreciable delay. This requirement shall be considered satisfied by one of the following arrangements:

An emergency lighting system, independent of the general lighting system, with provisions for automatically transferring, by means of devices approved for the purpose, the emergency system from a defective supply to another supply.

Two or more separate and complete systems with independent current supply, each providing emergency lighting. Unless both systems are kept lighted, means shall be provided for automatically lighting either system upon failure of the other. Either or both systems may be a part of the general house lighting system if circuits carrying lights for emergency illumination are installed in accordance with other paragraphs of this Section.

Wiring shall be kept entirely independent of all other wiring and equipment and shall not enter the same fixture, raceway, box or cabinet with other wiring except as permitted in this Paragraph when two or more separate systems are installed.

No appliances or lamps, other than those specified as required for emergency illumination, shall be supplied by such circuits except as provided in this Paragraph when two or more separate systems are installed.

All emergency lights shall be protected from possible physical damage.

Special Requirements for Overcurrent Devices of Emergency Lighting Systems

Par. 8455. Service overcurrent devices only may be placed ahead of the branch-circuit overcurrent devices.

The branch-circuit overcurrent devices shall be accessible to authorized persons only.

SECTION 846

SPECIAL ELECTRICAL REQUIREMENTS FOR CRANES AND HOISTS

Scope of Electrical Requirements for Cranes and Hoists

Par. 8460. The provisions of this Section shall apply to the installation of electrically operated cranes and hoists. When they are installed in hazardous locations, they shall comply with the requirements of Section 840.

Conductors on Cranes and Hoists

Par. 8461. Conductors on cranes and hoists shall be of the rubber-covered type except that asbestos insulated (Type A) or slow-burning conductors shall be used where exposed to severe external heat and between resistors and contact plates unless exposed to moisture, in which case rubber-covered conductors shall be used. Slow-burning (Type SB) conductors shall not be used where the temperature exceeds 194 degrees Fahrenheit (90 degrees Centigrade). When rubber-covered conductors are grouped, the group shall be taped with a flameproof covering. Varnished-cambric conductors (Type V) or asbestos varnished-cambric (Types AVA and AVB) may be used in dry locations.

Rubber-covered conductors shall be not smaller than No. 12 except on pilot circuits of controllers where No. 14 may be used.

Installation of Wiring on Cranes and Hoists

Par. 8462. Conductors on cranes and hoists shall be enclosed in rigid metal conduit or electrical metallic tubing except:

Short lengths of open conductors at resistors and collectors need not be enclosed.

Where flexible connections are necessary at motors and similar equipment flexible metallic conduit may be used.

In dry locations where space is limited individual conductors may be separately encased in flexible tubing securely fastened in place.

Short runs of wiring for control equipment located in a cab or on the bridge may be enclosed in auxiliary gutters.

Conductors leaving raceways shall comply with the provisions of Paragraph 8273.

Installation of Resistors on Cranes and Hoists

Par. 8463. When a crane operates over readily combustible material, the resistors shall be placed in a well-ventilated cabinet composed of incombustible material so constructed that it will not emit flames or molten metal, except where the resistors are located in a cab constructed of incombustible material which encloses the sides of the cab from the floor to a point at least 6 inches above the top of the resistors.

Collector Conductors for Cranes and Hoists

Par. 8464. Collector conductors along crane runways and crane bridges may be bare. They shall be in the form of wire or of tees, angles, tee rails, or other stiff shapes.

When wires are used as collector conductors they shall be not smaller than shown in the following table:

TABLE 8464T

Distance between rigid supports	Minimum Size of Wire
Not over 30 feet	No. 6
Not over 60 feet	No. 4
Over 60 feet	No. 2

Installation of Collector Conductors for Cranes and Hoists

Par. 8465. When wires are used as collector conductors for cranes or hoists, they shall be secured at the ends by means of approved strain insulators and shall be so mounted on approved insulators that the extreme limit of displacement of the wire will not bring the latter within less than one and one-half inches from the surface wired over.

Main collector conductors carried along runways shall be supported at intervals not exceeding 20 feet, and these supports shall be insulating except for the track rail where it is used for a conductor as permitted in this Paragraph. When run on the same horizontal plane such conductors shall be separated not less than 6 inches, except for monorail hoists where a spacing of not less than 3 inches may be used; when run otherwise, the spacing shall be not less than 8 inches. Where necessary, intervals between insulating supports may be increased up to 40 feet, the separation between conductors being increased proportionately.

Bridge collector conductors shall be kept at least two and one-half inches apart and, when the span exceeds 80 feet, insulating saddles shall be placed at intervals not exceeding 50 feet.

Conductors along runways and crane bridges, when of the rigid type specified in Paragraph 8464, shall be carried on insulating supports spaced at intervals of not more than 80 times the vertical dimension of the conductor, but in no case greater than 15 feet, and spaced apart sufficiently to give a clean electrical separation of conductors or adjacent collectors of not less than one inch. All sections of bare rigid collector conductors shall be mechanically joined to provide a continuous electrical connection.

Monorail, tramrail, or crane runway tracks may be used as a conductor of current for one phase of a three-phase alternating current system furnishing power to the carrier, crane, or trolley, provided the power for all phases is obtained from an insulating transformer, the voltage does not exceed 300 volts, and the rail serving as a conductor is effectively grounded at one point only, preferably at the transformer.

Except in locations to which only qualified persons are admitted, collector conductors shall be so isolated by elevation or shall be provided with suitable guards so arranged that persons cannot inadvertently touch the current-carrying parts while in contact with the ground or with conducting material connected to the ground.

Collector conductors shall not be used as feeders for any equipment other than the crane or cranes which they are primarily designed to serve.

Collectors for Cranes and Hoists

Par. 8466. Collectors for cranes or hoists shall be so designed as to reduce to a minimum sparking between them and the conductor, and when operated in rooms used for the storage of easily ignitible combustible fibers and materials the requirements of Paragraph 8405 shall be complied with.

Switches and Circuit-Breakers for Cranes and Hoists

Par. 8467. The main collector conductors for cranes or hoists shall be controlled by a switch or circuit-breaker, rated in amperes, readily operable from the ground and within sight of the collector conductors, and arranged to be locked in the open position.

When cranes are operated from a cab, a switch or circuit-breaker rated in amperes shall be provided in the leads from the main collector conductors. The switch or circuit-breaker shall be capable of interrupting the circuit under heavy loads and shall be readily controlled by the operator.

On both alternating-current and direct-current crane protective panels, the continuous ampere rating of the main-line switch or circuit-breaker, and main-line contactors, shall be not less than 50 per cent of the combined short-time ampere ratings of the motors, nor less than 75 per cent of the short-time ampere rating of the largest individual motor.

Protective Devices for Cranes and Hoists

Par. 8468. A limit switch shall be provided for upper limit of travel of cranes or hoists.

Cranes and hoists operated by polyphase alternating-current motors shall be provided with a device which will prevent starting of the motor if the phase rotation is in the wrong direction or if there is a failure in any phase.

For overcurrent protection of cranes and hoists, refer to Paragraph 8533.

SECTION 847

SPECIAL ELECTRIC WIRING FOR ELEVATORS

Scope of Special Electric Wiring for Elevators

Par. 8470. This section includes special requirements, additional to those of other applicable sections of this Part, for the installation of wiring and electrical equipment for elevators, dumbwaiters and similar apparatus.

Where elevators and dumbwaiters are installed in hazardous Commercial, Storage or Industrial locations and garages, the electric wiring and equipment shall also comply with the requirements of Sections 840 and 841.

General Requirements for Electric Wiring of Elevators

Par. 8471. The following voltage limitations shall apply to control and operating equipment of elevators:

> No part of any electric circuit having a voltage in excess of 750 volts shall be used on any control system. Circuits of higher voltage may be used for the operation of motors and brakes, provided that all control and signal wiring is thoroughly insulated from such power circuits, and all machine frames and metal hand-operated ropes are permanently grounded.
>
> The maximum voltage permitted in operating devices of automatic elevators having operating devices in the car and at the landings shall be 300 volts to ground.
>
> The maximum voltage permitted on push buttons of all elevator signaling circuits shall be 300 volts to ground.

All live parts of electrical equipment in or on elevator cars and dumbwaiters or in hoistways for same shall be enclosed.

No electric conduit or cables, except those used to furnish or control power, light, heat or signals for the elevator or hoistways, shall have an opening, terminal, outlet or junction within the hoistway, but shall be continuous between outlets or terminals situated entirely outside the hoistway. Long runs of conduit may include pull boxes for the purpose of supporting or pulling in conductors.

Electric "slack cable" switches shall be enclosed.

No circuit-breaker operated automatically by a fire alarm system shall cut off the power or interrupt the operating circuit of an elevator.

Wiring Methods for Elevators

Par. 8472. The following wiring methods shall be employed in the installation of elevators and dumbwaiters:

In Hoistways: Conductors located in the hoistways, except traveling cables, and conductors used in signal systems of Classes "B" or "C", shall be installed in rigid conduit, or electric metallic tubing, except that flexible conduit or armored cable may be used between riser and limit switches, interlocks, push buttons or similar devices.

On the Car: Conductors and traveling cables on the car shall be run in rigid conduit, electrical metallic tubing or wireways; except that short runs of either flexible conduit or armored cable may be used if so located as to be kept free from oil, and securely fastened in place, or Type S cord may be used as the flexible connection between the fixed wiring on the car and the switch on the car door or gate if securely fastened in a position not liable to mechanical injury.

Between Control Panels and Motors: The conductors of motor circuits between motors and control panel may be grouped without any additional insulation of the separate conductors, provided the complete group is either taped or corded, and painted in a manner to make same a rigid, self-supporting form, not over 3 feet long, and not in a position liable to mechanical damage or subject to a temperature in excess of 120 degrees Fahrenheit.

Size of Conductors for Elevators

Par. 8473. The minimum size of conductors for wiring of elevators shall be as follows:

For lighting circuits, No. 14, except that for flexibility, two or more No. 16 conductors may be used in parallel in traveling cables and on the car.

For elevator operating and control circuits, No. 16 meeting the requirements for fixture wires.

For signal circuits and for fixtures, No. 18.

Insulation of Conductors on Elevators

Par. 8474. The insulation of conductors installed in or on elevators shall comply with the following:

In auxiliary gutters used in machine rooms, under controllers, starters and similar apparatus for elevator machines, conductors shall be of the rubber-covered type.

Conductors between main circuit resistors and the back of control panels shall be of the slow-burning type (Type SB), asbestos-varnish-cambric type (Type AVA), or of the asbestos-covered type (Type A). All other wiring on control panels, unless subjected to a temperature exceeding 120 degrees Fahrenheit, shall be of the rubber-covered type having a flame-retardant, moisture-resistant outer cover or shall be of other type especially approved for the purpose.

Conductors or groups of conductors having flame-retardant outer cover shall not be used as connections for the operating circuits of elevator controllers unless such outer covering is also moisture-resistant.

Conductors having asbestos or other moisture-absorbing insulation or covering shall not be used for elevator operating circuits.

Traveling cables used as flexible connections between the car and the hoistway, shall be of Type E, elevator cable, or other approved type, and shall have a flame-retardant and moisture-resistant outer cover.

Installation of Electric Conductors for Elevators

Par. 8475. Where conductors leave raceways at control panels or other equipment for elevators, the raceway shall terminate not less than 6 inches from the floor.

Approved split or clamp fittings may be used on exposed conduit or electrical metallic tubing except where the conduit or tubing contains feeders.

The restrictions of Paragraph 8233 as to number of conductors in auxiliary gutters shall not apply.

Conductors of car-lighting circuits, and signal systems when not an integral part of the elevator wiring system, shall be separated and run in separate traveling cables and raceways.

Conductors for elevator circuits, including operating, control and power conductors, and signal conductors when an integral part of the wiring system, may be run in the same traveling cable or raceway system when the power supply is from the same source, even though the characteristics of the voltage or current may be changed within the system by rectifying, transforming or other converting devices supplied from the elevator feeder circuit; provided that all conductors are insulated for the maximum voltage found in the cable or raceway system, and the live parts of the equipment are insulated from ground for this maximum voltage. Such a traveling cable or raceway may also include a pair of telephone conductors to serve a telephone in the car, provided such conductors are insulated for the maximum voltage found in the cable or raceway system.

Traveling Electric Conductor Cables for Elevators

Par. 8476. Traveling conductor cables for elevator circuits other than signal, shall be of a composite assembly of copper and steel wires, unless one or more supporting fillers of cotton or hemp rope, or of cotton-covered or rubber-covered steel wire, are laid up with the conductors under the outer covering of the cable. In cables containing 6 or more conductors the supporting fillers shall be run straight through and not cabled with the conductors.

Traveling conductor cables for all signal circuits, and for all other circuits not over 100 feet in length, may be suspended by suitable clamps if the cables are so constructed that the weight of the cable is not carried by the individual conductors.

Wherever the traveling conductor cables in swinging may come in contact with projections or corners of the building construction in the hoistway, such as I beams, ledges and the like, such irregular surfaces shall be made smooth by covering with heavy gage sheet metal or other suitable means.

Control and Protection of Electrical Equipment for Elevators

Par. 8477. Where the elevator is controlled by varying the field current of a generator, the disconnecting means required by Paragraph 8346 shall be provided in the circuit supplying the motor which drives the generator.

Passenger elevators operated by polyphase alternating current motors shall be provided with a device which will prevent starting the motor when:

The phase rotation is in the wrong direction.

There is a failure in any phase.

Three ampere or smaller fuses shall be provided for the protection of No. 18 conductors used in signal circuits.

Installation of Electrical Equipment for Elevators

Par. 8478. The electric elevator machine and controller shall be installed in a room set aside for that purpose, or isolated by elevation or by means of an enclosure or wire grille or the like, to prevent accidental contact by persons or objects. This room may also contain other machinery used for the control and signaling of the elevator.

The following clearances shall be provided for mounting controllers:

> If a group of two or more elevator-control panels having wiring on the rear is located in a single machine room, there shall be a clear space of at least 36 inches back of the live parts, and not less than 18 inches on at least one side of the group. There shall also be at least 36 inches of clear space in front of the panels.
>
> Single panel controllers shall have at least 24 inches clear space in the rear, 18 inches clear space on one side, and 36 inches clear space in front.

When controllers are enclosed in the rear by removable cabinets the prescribed clearances shall apply when the back of the cabinet is removed.

Controllers of small sizes may be mounted on the elevator machinery provided the rear of the panel is accessible.

Grounding of Electrical Equipment for Elevators

Par. 8479. All metal raceways attached to elevator cars shall be bonded to grounded metal parts of the car with which they come in contact.

For electric elevators, the frames of all motors, elevator machines, controllers and the metal enclosures for all electrical devices in or on the car or in the hoistway shall be grounded.

For elevators other than electric, if any electrical conductors are attached to the car, the metal frame of the car, if normally accessible to persons, shall be grounded.

All hand-operated metallic shifting ropes or cables shall be grounded.

Equipment mounted on members of the structural metal frame of a building shall be deemed to be grounded. Metal car frames supported by metal hoisting cables attached to or running over sheaves or drums of elevator machines shall be deemed to be grounded when the machine is grounded in accordance with Chapter 86.

CHAPTER 85

OVERCURRENT PROTECTION

Sec. 850—General Requirements for Overcurrent Protection.
Sec. 851—Overcurrent Protection of Conductors and Electric Services.
Sec. 852—Overcurrent Protection of Generators, Motors, and Motor Circuits.
Sec. 853—Overcurrent Protection of Miscellaneous Circuits and Equipment.

SECTION 850

GENERAL REQUIREMENTS FOR OVERCURRENT PROTECTION

General Requirements for the Installation of Overcurrent Protective Devices

Par. 8500. Every electric circuit or appliance shall be provided with overcurrent protective devices as required by this Chapter.

Overcurrent devices shall be connected into the circuit at the point where the conductor to be protected receives its supply, except when other locations for such devices are specifically permitted by this Code.

Overcurrent devices shall be located where they will be readily accessible, except as provided in Paragraph 8516 for service equipment, and Paragraph 8238 for busways. They shall not be placed where they will be exposed to mechanical injury nor in the vicinity of easily ignitible material.

Enclosures for Overcurrent Protective Devices

Par. 8501. Overcurrent protective devices shall be enclosed in cutout boxes or cabinets, unless a part of a specially approved assembly which affords equivalent protection, or unless mounted on switchboards, panelboards or controllers located in rooms or enclosures free from easily ignitible material and dampness. The operating handle of a circuit-breaker may be accessible without opening a door or cover.

Where enclosures for overcurrent devices are exposed to moisture, they shall be of a type approved for such locations, and shall be so mounted that there is at least one-half inch air space between the enclosure and the supporting surface.

Enclosures for overcurrent devices shall be mounted in a vertical position unless in individual instances this is shown to be impracticable.

Overcurrent Protective Devices In Grounded Conductors

Par. 8502. No overcurrent device shall be placed in any permanently grounded conductor unless the device simultaneously opens all conductors of the circuit.

In locations where the conditions of grounding or the likelihood of reversal of connection warrants, the Buildings Engineer may require, on systems having a grounded neutral or having one side grounded, that the conductors of 2-wire branch circuits shall have an overcurrent device in each conductor.

In existing unpolarized installations, the conductors of 2-wire branch circuits shall have an overcurrent device in each conductor unless all lampholders have the grounded conductor connected to the screw-shell.

Use of Plug Fuses

Par. 8503. Plug fuses and fuse-holders shall not be used in circuits exceeding 125 volts between conductors, except circuits of a system having a grounded neutral and no conductor at more than 150 volts to ground.

Fused Rosettes

Par. 8504. Fuses shall not be mounted in rosettes.

Disconnection of Fuses and Thermal Cutouts

Par. 8505. Fuses and thermal cutouts, in circuits of more than 150 volts to ground, where accessible to other than qualified persons, shall be so arranged that all fuses or thermal cutouts in each individual circuit can be independently disconnected from all sources of electrical energy before they are touched, except that a single disconnecting means may serve a group of fuses or thermal cutouts where a number of motors drive several parts of a single machine or apparatus.

Arcing or Suddenly-Moving Parts

Par. 8506. Fuses and circuit-breakers shall be so located or shielded that persons will not be burned or otherwise injured by their operation. Handles or levers of circuit-breakers and similar parts which may move suddenly in such a way that persons in the vicinity might be injured by being struck by them, shall be guarded or isolated.

SECTION 851

OVERCURRENT PROTECTION OF CONDUCTORS AND ELECTRIC SERVICES

General Requirements for Overcurrent Protection of Conductors and Electric Services

Par. 8510. Each ungrounded service-entrance conductor shall have overcurrent protection provided by an overcurrent device in series with it.

In all other circuits, except as provided in Paragraph 8527, an overcurrent device (fuse or circuit-breaker) shall be placed in each ungrounded conductor, except that if circuit-breakers are used the minimum number and position of the overcurrent units shall be as given in the following table and diagrams, in which case the circuit-breaker shall open all ungrounded conductors of the circuit. Individual single-pole circuit-breakers may be used for the protection of each conductor of ungrounded 2-wire circuits, each ungrounded conductor of 3-wire direct current or single-phase circuits, or for each ungrounded conductor of lighting or appliance branch circuits connected to 4-wire three-phase systems, provided such lighting or appliance circuits include a grounded conductor.

For table of over-current units for motor protection, refer to Paragraph 8527.

TABLE 8510T

SYSTEM	*Number and location of Over-current Units, Such as Trip Coils, or Relays.
2-Wire, Single-phase A. C. or D. C. Ungrounded.	One (in either conductor. Place always in conductors connected to same side of the circuit. Fig. 1).
2-Wire, Single-phase A. C. or D. C., One Wire Grounded.	One (in ungrounded conductor. Fig. 2).
2-Wire, Single-phase A. C. or D. C., Mid-point Grounded.	Two (one in each conductor. Fig. 3).
2-Wire, Single-phase, A. C. Derived from 3-phase, with Ungrounded Neutral.	Where a group of feeders is fed from the three phases of a common, three-phase bus, each conductor served by either of two conductors of the three-phase bus must be equipped with one over-current unit. This will result in some circuits being equipped with one unit and others with two units. Fig. 4.
2-Wire, Single-phase Derived from 3-phase, Grounded Neutral System by Using outside Wires of 3-Phase Circuit.	Two (one in each conductor. Fig. 5).
3-Wire, Single-phase A. C. or D. C., Neutral Grounded or Ungrounded.	Two (one in each conductor except neutral conductor. Fig. 6).
3-Wire, 2-Phase, A. C., Common Wire, Grounded or Ungrounded.	Two (one in each conductor except common conductor. Fig. 7).
4-Wire, 2-Phase, Ungrounded, Phases Separate.	Two (one in each phase. Place always in conductors connected to same side of the circuit in each phase. Fig. 8).
4-Wire, 2-Phase, Grounded Neutral, or 5-Wire, 2-Phase, Grounded or Ungrounded.	Four (one in each conductor except neutral conductor. Fig. 9).

TABLE 8510T—Continued

SYSTEM	*Number and location of Over-current Units, Such as Trip Coils, or Relays.
3-Wire, 3-Phase, Ungrounded.	a. Three (one in each conductor if the circuit is served by a Y △ or △ Y transformer having the Y neutral in either case ungrounded or not connected to the circuit. Fig. 10). b. Two, under all other conditions. Place always in same phases.
3-Wire, 3-Phase, 1 Wire Grounded.	Two (one in each ungrounded conductor. Fig. 11).
3-Wire, 3-Phase, Grounded Neutral.	Three (one in each conductor. Fig. 12).
3-Wire, 3-Phase, Midpoint of One Phase Grounded.	Three (one in each conductor. Fig. 13).
4-Wire, 3-Phase, Neutral Grounded or Ungrounded.	Three (one in each conductor except neutral conductor. Fig. 14).

*1. Where the above table calls for one over-current unit, this shall consist of one series over-current tripping device, or the combination of one current transformer and one secondary over-current tripping device.

2. Where it calls for two over-current units, these shall consist of two series over-current tripping devices or the combination of two current transformers and two secondary over-current tripping devices.

3. Where it calls for three over-current units, these shall consist of three series over-current tripping devices or the combination of two or three secondary over-current tripping devices with three current transformers.

4. Where it calls for four over-current units, these shall consist of four series over-current tripping devices or four current transformers with four secondary over-current tripping devices.

5. Where standard devices are not available with three or four over-current units as required in the table, it is permissible to substitute two over-current units and one fuse where three over-current units are called for, two over-current units and two fuses where four units are called for. The fuse or fuses are to be placed in the conductors not containing an over-current unit.

SINGLE-PHASE

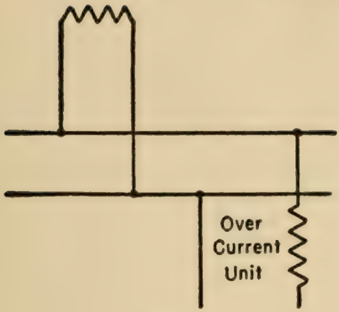


FIG. 1

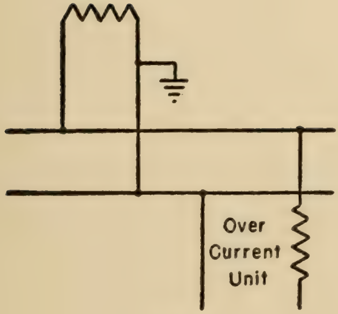


FIG 2

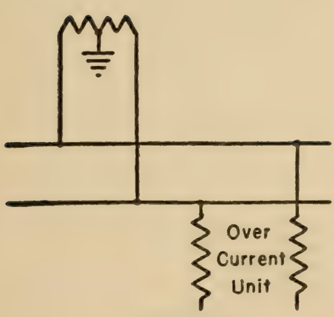


FIG 3

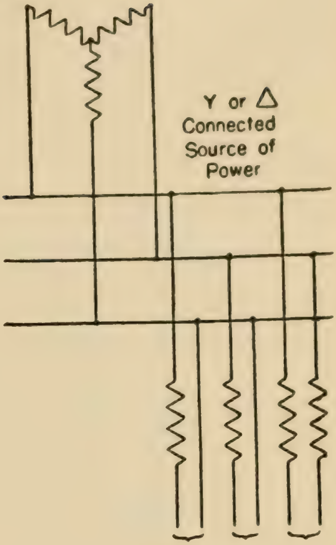


FIG 4

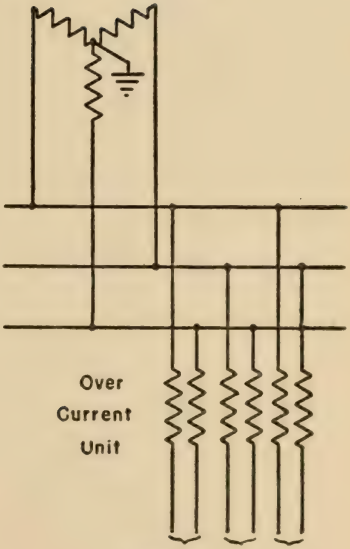


FIG. 5

SINGLE AND TWO-PHASE

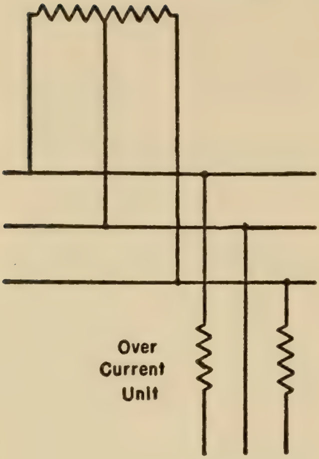


FIG. 6

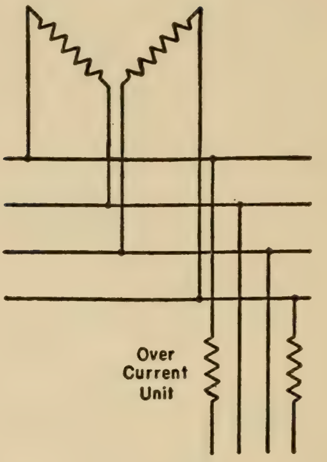


FIG. 8

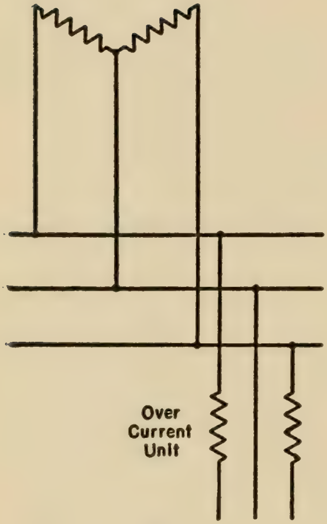
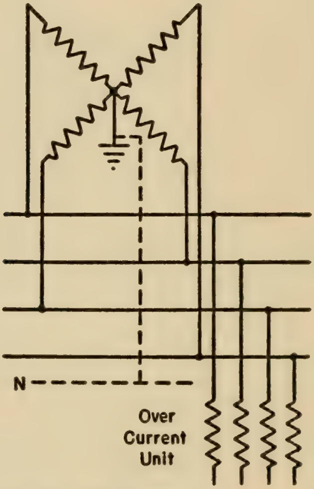


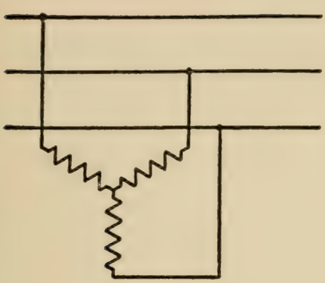
FIG. 7



Note-Neutral Grounded or Ungrounded for 2 Phase, 5 Wire System.

FIG. 9

THREE-PHASE



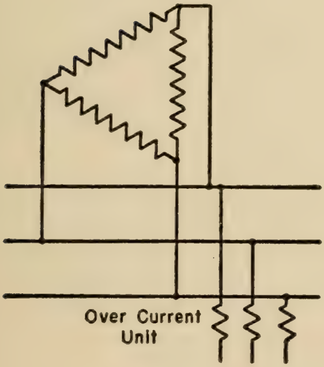


FIG. 10

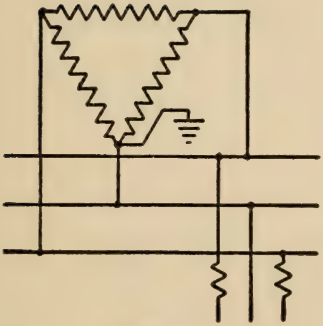


FIG. 11

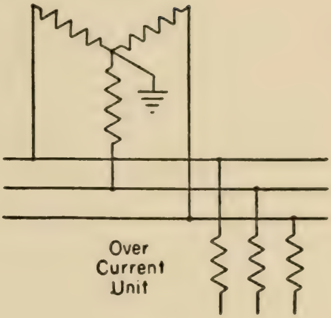


FIG. 12

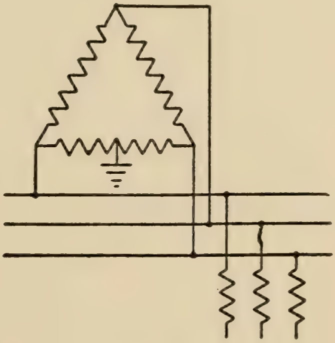


FIG. 13

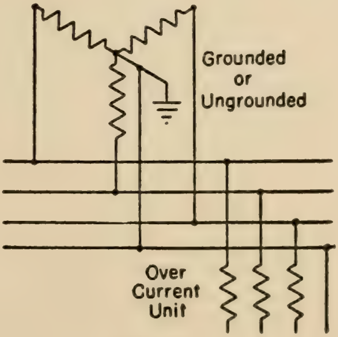


FIG 14

Thermal cutouts, thermal relays, and other devices not designed to open short-circuits, shall not be used for overcurrent protection of conductors.

Ratings and Settings of Overcurrent Protective Devices—Devices for Conductors and Electric Services

Par. 8511. For the ratings of overcurrent devices protecting the conductors of fixture wires and portable cords, refer to Paragraph 8515; of motor circuits, refer to Paragraphs 8525, 8526, 8527; of remote-control circuits, refer to Paragraph 8528; of taps from feeders, refer to Paragraph 8514, and the conductors of branch circuits, refer to Section 804.

For the overcurrent protection of all other conductors, fuses or circuit-breakers of the time-delay, thermal-trip type with fixed setting shall be rated at not more than the allowable capacity of the conductor as given in Paragraph 8050; circuit-breakers of the time-delay, magnetic trip or the instantaneous type shall be set to operate at not more than 125 percent of the allowable capacity of the conductor.

When the allowable current-carrying capacity of the conductor does not correspond to the standard sizes or ratings of overcurrent devices, the next larger size or rating may be used, provided its size or rating does not exceed 150 per cent of the allowable current-carrying capacity of the conductor.

Use of Fuses In Multiple

Par. 8512. For the protection of conductors, except the conductors of motor-branch circuits, having allowable carrying capacities exceeding the rated capacity of the largest approved cartridge type fuse, cartridge fuses arranged in multiple may be used, provided as few fuses as possible are used and the fuses are of the same type, characteristics, and rating, and provided the fuse-holder terminals are mounted on a single continuous pair of bus bars, or have an equivalent arrangement that will eliminate any potential difference between the terminals of the fuses.

Overcurrent Protection of Grounded Conductors

Par. 8513. A grounded conductor is considered to be protected from overcurrent if a protective device of a suitable rating or setting is provided in each ungrounded conductor of the same circuit.

Overcurrent Protection of Feeder Taps

Par. 8514. When a tap to a feeder conductor is not accessible, the overcurrent protective device for the tap shall be placed where it will be accessible and installed in accordance with one of the following provisions:

When the overcurrent device protecting the larger conductor also protects the smaller conductor.

When the smaller conductors have a current-carrying capacity of not less than the sum of the allowable current-carrying capacities for the conductors of the one or more circuits or loads which the tap supplies, provided the tap is not over 5 feet long and does not extend beyond the switchboard, panelboard, or control devices which it supplies and is enclosed in conduit, electrical metallic tubing or in metal gutters when not a part of the switchboard or panelboard.

When the smaller conductors have a current-carrying capacity at least one-third that of the conductor from which they are supplied, and provided the tap is suitably protected from mechanical injury, is not over 25 feet long, and terminates in a single circuit-breaker or set of fuses which will limit the load on the tap to its allowable current-carrying capacity.

Location of Overcurrent Protective Device for Electric Services

Par. 8516. The service overcurrent device shall be an integral part of the service disconnecting means or shall be located immediately adjacent thereto, unless located at the outer end of the service raceway.

Special Arrangements of Overcurrent Protective Devices for Electric Services

Par. 8517. The main overcurrent device may be omitted from service entrance conductors supplying not more than six sub-circuits provided that each sub-circuit is protected by a circuit-breaker or a set of fuses controlled by an individual disconnecting means, the overcurrent protective devices being grouped and located as near as practicable to the point of service entrance or provided fuses protecting the sub-circuits are in the same enclosure with a main disconnecting means.

A service entrance shall be protected by a single set of overcurrent devices where there are more than six subdivisions of the service. In multiple-tenancy buildings the main service overcurrent protective device shall be so located as to be readily accessible to all tenants.

Inaccessible Service Overcurrent Protective Devices

Par. 8518. If the service overcurrent devices are locked or sealed, or otherwise not readily accessible another overcurrent device of lower rating shall be installed in an accessible location and connected into the circuit on the load side of the service protective device.

Sealed Overcurrent Protective Device for Electric Services

Par. 8519. If necessary to prevent tampering, an automatic overcurrent device protecting service conductors supplying only a special load such as a water heater, may be locked or sealed if located so as to be accessible.

SECTION 852

OVERCURRENT PROTECTION OF GENERATORS, MOTORS, AND MOTOR CIRCUITS

Generators Required to Have Overcurrent Protection

Par. 8520. Constant-potential generators, except alternating-current generators and their exciters, shall be protected from excessive current by circuit-breakers or fuses.

Overcurrent Protection of Two-Wire Direct Current Generators

Par. 8521. Where two-wire, direct-current generators have overcurrent protection in one conductor only, the overcurrent device shall be actuated by the entire current generated, except that the overcurrent device shall not open the shunt field.

Overcurrent Protection of Three-Wire Direct Current Generators.

Par. 8522. Three-wire, direct-current generators, whether compound or shunt wound, shall be equipped with over current devices, one in each armature lead, and so connected as to be actuated by the entire current from the armature. Such over current devices shall consist either of a double-pole, double-coil circuit-breaker, or of a 4-pole circuit-breaker connected in the main and equalizer leads and tripped by two overcurrent devices, one in each armature lead. Such protective devices shall be so interlocked that no one pole can be opened without simultaneously disconnecting both leads of the armature from the system.

Overcurrent Protection of Balancer Sets

Par. 8523. Two-wire, direct-current generators used in conjunction with balancer sets to obtain neutrals for 3-wire systems shall be equipped with overcurrent devices which will disconnect the 3-wire system in the case of excessive unbalancing of currents.

Overcurrent Protection of Motor-Driven Generators of 65 Volts or Less

Par. 8524. Generators operating at 65 volts or less and driven by individual motors shall be considered as protected by the overcurrent device protecting the motor if these devices will operate when the generators are delivering not more than 150 percent of their full-load rated current.

Overcurrent Protection of Motor-Feeder Conductors

Par. 8525. A feeder which supplies more than one motor shall be provided with overcurrent protection which shall not have a rating or setting higher than the largest branch-circuit protective device for any motor of the group, plus the sum of the full-load currents of the other motors of the group. If two or more motors of equal horsepower rating are the largest in the group, one of these motors should be considered as the largest for the purpose of determining the rating or setting of the feeder overcurrent device.

If a feeder supplies a motor load and in addition a lighting or a lighting and appliance load, the feeder overcurrent protective device shall have a rating or setting not greater than that specified above plus the appropriate rating or setting for the lighting and appliance load.

Overcurrent Protection of Motor-Branch-Circuit Conductors

Par. 8526. All motor-branch circuits shall have overcurrent protection capable of carrying the starting current of the motor, consisting of a fuse in each ungrounded conductor or a device other than fuses that opens all ungrounded conductors and is equipped with overcurrent units in accordance with the table in Paragraph 8510.

For an individual motor the rating or setting of the branch-circuit overcurrent protective device shall not exceed the values given in Paragraph 8060, provided that where the rating or setting specified in the table is not sufficient for the starting current of the motor, it may be increased but shall in no case exceed 400 percent of the motor full-load current.

Two or more motors may be connected to the same branch circuit under the following conditions only:

Where the full-load current of each motor does not exceed 6 amperes and the motor-branch circuit is protected at not more than 15 amperes at 125 volts or 10 amperes at 250 volts, or such motors are used with lamps and appliances on the 15-, 20-, and 25-ampere branch circuits specified in Section 804.

Where each motor is protected by a thermal cutout or other motor-running-overcurrent device approved for group installation, and also equipped with controller approved for group installation, and the branch circuit is protected by an overcurrent device having a rating equal to that previously specified in this paragraph for the largest motor connected to the circuit plus the sum of the full-load currents of the other motors, provided the capacity of the branch-circuit overcurrent device is not larger than allowed by Paragraph 8527 for the thermal cutout or relay protecting the smallest motor in the group. The conductors of any tap supplying a single motor need not have individual overcurrent protection, provided they have either the same current-carrying capacity as the motor branch circuit conductor or at least 1/3 the current-carrying capacity of the motor branch circuit conductor with a minimum in accordance with Paragraph 8049, are protected from mechanical injury, and are not more than 25 feet long.

Circuit-breakers for motor-branch-circuit protection shall have a continuous rating of not less than 125 percent of the full-load current ratings of the motors.

Motor-branch-circuit overcurrent protection and motor-running overcurrent protection may be combined in a single overcurrent device if the rating or setting of the device provides the running overcurrent protection specified in Paragraph 8527.

Running Overcurrent Protection of Motors

Par. 8527. Continuous duty motors rated more than 1 horsepower shall have running overcurrent protection not greater than 125 percent of the full-load current rating of the motor. The overcurrent protection for a motor not exceeding 5 horsepower, especially designed and used as a part of approved refrigeration equipment, may exceed 125 percent but shall not exceed 140 percent of the rated current of the motor.

Continuous duty motors of 1 horsepower or less which are manually started and which are in a location within sight of the operator are considered as protected against overcurrent by the overcurrent device protecting the conductors of the branch circuit provided its rating is not greater than that specified in Paragraph 8526 except for motors used on the 15-, 20, and 25-ampere branch circuits described in Section 804. Any such motor which is in a location out of sight of the operator shall be protected as specified below for automatically-started motors.

Continuous duty motors of 1/8 to 1 horsepower inclusive which are started automatically shall be considered as protected against overcurrent under any of the following conditions:

> Where they are provided with overcurrent running protection not greater than 140 percent of the normal full-load rating of the motor.
>
> Where they are provided with inherent overheating protection.
>
> Where they are part of an approved assembly which does not normally subject the motor to overloads and which is also equipped with other safety controls (such as the safety combustion controls of a domestic oil burner) which protect the motor against damage due to stalled motor current.

Continuous duty motors of less than 1/8 horsepower automatically started, are considered as protected against overcurrent by the overcurrent device protecting the conductors of the branch circuits.

The secondary circuits of wound-motor alternating current motors, including conductors, controllers, resistors, etc., are considered as protected against overcurrent by the motor-running overcurrent device.

Motors of short-time, intermittent, periodic, or varying duty are considered as protected against overcurrent by the branch-circuit overcurrent device, provided its rating or setting does not exceed that specified in Paragraph 8060.

Where the values specified for motor-running overcurrent protection do not correspond to the standard sizes or ratings of fuses, circuit-breakers, thermal cutouts, or thermal relays, or the heating elements of thermal-trip motor switches, the next larger size or rating may be used, provided the size or rating does not exceed 150 per cent of the full-load current rating of the motor.

Motor running overcurrent protection may be shunted or cut out of circuit during the starting period of a motor, provided the device by which the overcurrent protection is shunted or cut out cannot be left in the starting position, and the motor shall be considered as protected against overcurrent during the starting period if fuses or time-delay circuit-breakers rated at not over 400 per cent of the full-load current of the motor, are so located in the circuit as to be operative during the starting period of the motor.

If fuses are used for motor-running protection, a fuse shall be inserted in each ungrounded conductor.

If devices other than fuses or thermal cutouts are used for motor-running protection, the overcurrent device shall disconnect a sufficient number of ungrounded conductors to interrupt current flow to the motor, and the following table shall govern the minimum allowable number and location of the overcurrent units such as trip coils, relays, or thermal cutouts.

TABLE 8527T.

Kind of Motor	Supply System	Number and location of over-current units, such as trip coils, relays or thermal cut-outs
1-phase A. C. or D. C.	2-wire, 1-phase A. C. or D. C., ungrounded	1 in either conductor
1-phase A. C. or D. C.	2-wire, 1-phase A. C. or D. C., one conductor grounded	1 in ungrounded conductor
1-phase A. C. or D. C.	3-wire, 1-phase, A. C. or D. C., grounded-neutral	1 in ungrounded conductor
2-phase A. C.	3-wire, 2-phase A. C., ungrounded	2, one in each phase
2-phase A. C.	3-wire, 2-phase A. C., one conductor grounded	2 in ungrounded conductors
2-phase A. C.	4-wire, 2-phase A. C. grounded or ungrounded	2, one per phase in ungrounded conductors
2-phase A. C.	5-wire, 2-phase A. C., grounded-neutral or ungrounded	2, one per phase in any ungrounded phase wire
3-phase A. C.	3-wire, 3-phase A. C. ungrounded	2 in any 2 conductors
3-phase A. C.	3-wire, 3-phase A. C., one conductor grounded	2 in ungrounded conductors
3-phase A. C.	3-wire, 3-phase A. C., grounded-neutral	2 in any 2 conductors
3-phase A. C.	4-wire, 3-phase, A. C., grounded-neutral or ungrounded	2 in any 2 conductors, except the neutral

A motor controller may also serve as the running overcurrent device if the number of overcurrent units complies with the preceding table and if these overcurrent units are operative in both the starting and running position in the case of a

D.C. motor, and in the running position in the case of an A.C. motor.

Thermal cutouts, thermal relays, and other devices for motor-running protection which are not capable of opening short-circuits, shall be protected by fuses or circuit-breakers of not over 4 times the rating of the motor for which they are designed, unless approved for group installation, and marked to indicate the maximum size of fuse by which they must be protected.

Motor-running overcurrent devices other than fuses shall have a rating of at least 115 percent of the full-load current rating of the motor.

Overcurrent Protection of Remote Control Circuits

Par. 8528. The conductors of control circuits of remote-controlled equipment are considered as being properly protected by the branch-circuit overcurrent devices under any one of the following conditions:

Where the rating or setting of the branch-circuit overcurrent device is not more than 500 percent of the carrying capacity of the control-circuit conductors, and the overcurrent device is not of the so-called time-lag type.

Where the controlled device and the point of control, such as start and stop buttons, pressure switch, thermostatic switch, are both located on the same machine and the control circuit does not extend beyond the machine.

Where the opening of the control circuit would create a hazard; as for example, the control circuit of fire-pump motors.

SECTION 853

OVERCURRENT PROTECTION OF MISCELLANEOUS CIRCUITS AND EQUIPMENT

Overcurrent Protection of Electric Appliances

Par. 8530. Portable appliances, except motors and generators, are considered as protected against overcurrent under one of the following conditions:

When supplied from one of the branch circuits of Section 804, and in accordance with the requirements therein specified.

When supplied by an individual branch circuit having overcurrent protection not exceeding 150 per cent of the rating of the appliance.

Fixed appliances are considered as being protected against overcurrent under one of the following conditions:

When supplied from one of the branch circuits of Section 804, and in accordance with the requirements therein specified.

When grouped on a branch circuit having overcurrent protection rated at not less than the combined rating of the appliances and not to exceed 35 amperes; except that a range and water heater, or a group of cooking appliances, may be grouped on a branch circuit having overcurrent protection not to exceed 50 amperes.

When supplied by an individual branch circuit having overcurrent protection not to exceed 150 percent of the rating of the appliance. Where such a circuit supplies a range, hot plate, or similar appliance having surface heating elements, the overcurrent protection shall not exceed 70 amperes; except where the appliance has subdivided circuits, each of which has overcurrent protection not exceeding 50 amperes.

Overcurrent Protection of Panelboards

Par. 8531. Panelboards supplying only lighting and appliance branch circuits, and supplied by conductors having overcurrent protection greater than 200 amperes, shall be protected on the supply side by overcurrent devices having a rating not greater than that of the panelboard.

Overcurrent Protection of Transformers

Par. 8532. When supplied by circuits of 600 volts or less, each transformer or bank of transformers operating as a unit, where located in a building, shall be separately protected on the primary side by an automatic overcurrent device rated or set at not more than 200 percent of the full-load current rating of the transformer or bank of transformers except potential instrument transformers which shall be protected in the primary circuit by a fuse rated at not more than 5 amperes.

For the overcurrent protection of transformers having a primary potential of more than 600 volts, refer to Paragraph 8741.

Overcurrent Protection for Cranes and Hoists

Par. 8533. The main collector conductors shall be protected by an overcurrent device.

Where more than one motor is employed on a crane, each motor shall have individual overcurrent protection as provided in Section 852 except that if two motors operate a single hoist, carriage, truck, or bridge and are controlled as a unit by one controller, the pair of motors with their leads may be protected by a single overcurrent device which shall be located in the cab if there is one.

Overcurrent Protection of Feeders at Supply Stations

Par. 8534. Each conductor of a constant-potential circuit entering or leaving a supply station, except grounded neutral conductors, shall be protected from excessive current by a circuit-breaker or by an equivalent device of approved design. Such protective devices shall be located as near as practicable to the point where the conductors enter or leave the building. For outgoing circuits not connected with other sources of power, the protective devices may be placed on the supply side of transformers or similar devices.

Overcurrent Protection of Switchboard Instrument Circuits

Par. 8535. Instruments, pilot lights, potential transformers, and other switchboard devices with potential coils, except where the operation of the protective device might introduce a hazard in the operation of devices, shall be supplied by a circuit that is protected by standard overcurrent devices of a rating not greater than 15 amperes, except that for ratings of 2 amperes or less special types of enclosed fuses may be used.

Overcurrent Protection of Sound Systems

Par. 8536. The "A" circuit of sound systems shall have overcurrent protection not exceeding 15 amperes when supplied by branch lighting circuits or by storage batteries of more than 20 ampere-hour rating.

The "B" circuits shall have overcurrent protection not exceeding one ampere which shall be placed in each positive lead.

The "C" circuits are not required to have overcurrent protection.

Overcurrent devices shall be installed as near as practicable to the battery or other source of supply.

CHAPTER 86

GROUNDING

Sec. 860—General Grounding Requirements.
Sec. 861—Grounding of Electric Circuits.
Sec. 862—Grounding of Raceways, Equipment, Etc.
Sec. 863—Grounding Electrodes.
Sec. 864—Grounding Conductors.
Sec. 865—Interconnection of Primary Arrester and Secondary Neutral.

SECTION 860

GENERAL GROUNDING REQUIREMENTS

Scope of Grounding Requirements

Par. 8600. Sections 860 and 865, inclusive, treat of protection in the use of electrical circuits and equipment by grounding. Insulation, isolation, and guarding are suitable alternatives under certain conditions.

Objectionable Currents In Grounding Conductors

Par. 8601. The grounding of wiring systems, circuits, equipment, arresters, cable armor, conduit, or other metal raceways as a protective measure shall be so arranged that there will be no objectionable passage of current over the grounding conductors. The temporary currents set up under accidental conditions, while the grounding conductors are performing their intended protective functions, are not to be considered as objectionable. If an objectionable flow of current occurs over a grounding conductor, due to the use of multiple grounds, one or more of such grounds shall be abandoned, or their location shall be changed, or the continuity of the conductor between the grounding connections shall be suitably interrupted, or other means satisfactory to the Buildings Engineer shall be taken to limit the current.

Carrying Capacity and Impedance of Path to Ground

Par. 8602. The path to ground from circuits, equipment, or conductor enclosures shall be permanent and continuous and shall have ample carrying capacity to conduct safely any currents liable to be imposed on it, and shall have impedance sufficiently low to limit the potential above ground, and to facilitate the operation of the overcurrent devices in the circuit.

Spacing of Metal Parts From Lightning Rods

Par. 8604. Metal enclosures of conductors, and metal frames and cases of electrical equipment, shall, wherever practicable, be kept at least 6 feet away from lightning conductors. Where it is not practicable to secure 6 feet separation, they shall be bonded together.

SECTION 861

GROUNDING OF ELECTRIC CIRCUITS

Grounding Requirements for Two-Wire Direct-Current Circuits

Par. 8610. One wire of a 2-wire direct-current system supplying interior wiring systems, and operating at not more than 300 volts between conductors, shall be grounded, unless such system is used for supplying industrial equipment in limited areas and the circuit is equipped with a ground detector.

When the system is to be grounded, the grounding connection shall be made at one or more supply stations, but not at individual services and not elsewhere on interior wiring.

Grounding Requirements for Three-Wire Direct-Current Circuits

Par. 8611. The neutral conductor of all 3-wire direct-current systems supplying interior wiring systems shall be grounded.

When the system is to be grounded, the grounding connection shall be made at one or more supply stations, but not at individual services and not elsewhere on interior wiring.

Alternating-Current Circuits To Be Grounded

Par. 8612. Secondary alternating-current systems supplying interior wiring, and interior alternating-current wiring systems, shall be grounded if they can be so grounded that the maximum voltage to ground does not exceed 150.

Location of Ground Connection for Alternating-Current Circuits

Par. 8613. Alternating-current interior wiring systems supplied by a secondary distribution system shall have the grounding connection made at each individual service on the supply side of the service disconnecting means. By special permission of the Buildings Engineer any individual grounding connection may be omitted, provided the secondary circuit has other good grounding connections. Additional grounding connections shall be made at the transformer or elsewhere, but not on the load side of the service disconnecting means except as provided in Paragraph 8616.

Conductor To Be Grounded On Alternating-Current Circuits

Par. 8614. For alternating-current interior wiring systems, the conductor to be grounded shall be as follows:

Single-phase, 2-wire: the identified conductor;
Single-phase, 3-wire: the identified neutral conductor;
Multiphase systems having one wire common to all phases: The identified common conductor;
Multiphase systems having one phase grounded: the identified conductor;
Multiphase systems in which one phase is used to supply single-phase, 3-wire: the identified neutral conductor. One phase only can be grounded.

Multiple Grounding Within a Building

Par. 8615. The grounding connection to an interior wiring system shall be made at one point only within a building.

Grounding Requirements for a Master Service

Par. 8616. In a property comprising more than one building under single management and served by a master service, the interior wiring system in any building supplied indirectly from such service may be grounded as near as practicable to the entrance of the conductors to the building, whether the switch controlling the particular building is inside or outside of the building.

The grounded conductor of the secondary distribution system shall be run to each building served.

Grounding Requirements for a Isolated Plant

Par. 8617. For an interior wiring system or circuit not connected to an exterior secondary distribution system, the ground connection shall be made at the transformer, generator, or other source of supply, or at the switchboard, on the supply side of the first switch controlling the system.

Grounding of Instrument-Transformer Secondaries

Par. 8618. The secondary circuits of current and potential instrument-transformers shall be grounded if the primary windings are connected to circuits of 300 volts or more to ground, and, if on switchboards, shall be grounded irrespective of voltage.

Grounding Requirements for Miscellaneous Circuits

Par. 8619. Circuits of less than 50 volts need not be grounded, except as follows:

a. If supplied by transformers on circuits of more than 150 volts to ground.
b. If supplied by transformers on ungrounded circuits.
c. If run overhead between buildings.

Electric furnace circuits need not be grounded.

Circuits for electric cranes operating over combustible fibers in Class III or Class IV hazardous locations shall not be grounded. Refer to Paragraph 8405.

SECTION 862

GROUNDING OF RACEWAYS, EQUIPMENT AND GUARDS

Service Raceways and Cable Sheaths To Be Grounded

Par. 8620. All service raceways and service cable sheaths or armor, if of metal, shall be grounded.

Service conduit or metal pipe from underground supply is considered to be grounded if it contains metal-sheathed cable bonded to a continuous underground metal-sheathed cable system. The sheath or armor of service cable is considered to be grounded if it is metallically connected to a continuous underground metal sheathed cable system, or if the service cable contains an uninsulated grounded service conductor in continuous electrical contact with its metallic armor or tape.

Interior Raceways and Cable Armor To Be Grounded

Par. 8621. Metal raceways or cable armor shall be grounded, except in runs of less than 25 feet which are free from probable contact with ground or grounded metal and which, where within reach from grounded surfaces, are guarded against contact by persons.

The point of attachment of the grounding conductor for interior metal raceways, cable armor and the like shall be as near as practicable to the source of supply and shall be so chosen that no raceway or cable armor is grounded through a run of smaller size than is required by Paragraph 8646.

Fixed Equipment To Be Grounded

Par. 8622. All exposed, non-current-carrying metal parts of fixed equipment, which are liable to become energized, shall be grounded except the equipment specifically exempted in Paragraph 8623, or unless the written permission of the Buildings Engineer to omit the grounding connection is secured, in which case the frame, or similar parts, shall be permanently and effectively insulated from the ground.

Electric ranges are considered as fixed equipment even where connection is made to the range by means of a flexible cable.

Where non-metallic sheathed cable is the wiring method employed, metal lighting fixtures mounted on metal or metal-lath ceilings or walls shall be grounded unless the fixtures are insulated from their supports and from the metal lath by the use of insulating joints or fixture supports and canopy insulators.

Fixed Equipment Exempted From Grounding

Par. 8623. Exposed, non-current-carrying metal parts of the fixed equipment listed below are not required to be grounded under the stated conditions:

Enclosures for switches or circuit-breakers where accessible to qualified persons only.

Controllers attached to ungrounded portable equipment.

Lined covers of snap switches.

Pendent lamps on circuits of not more than 150 volts to ground.

Electric signs, including troughs, frames, and tube terminal boxes that are inaccessible to unauthorized persons and are insulated from ground and from other conductive objects.

Transformers mounted on wooden poles at a height of more than 8 feet from the ground.

Frames for direct-current single-polarity switchboards when they are insulated for the full voltage.

Portable Equipment To Be Grounded

Par. 8624. All exposed, non-current-carrying metal parts of portable equipment operating at more than 150 volts to ground shall be grounded unless the written permission of the Buildings Engineer to omit the grounding connection is secured, in which case suitable guards or insulation shall be provided.

All exposed metal parts of portable equipment used in beauty parlors, barber shops, outlets for washing machines, and in hazardous locations or in therapy, shall be grounded regardless of the voltage at which they operate.

In other than residential occupancies, exposed metal parts of portable appliances used in damp or wet locations or by persons standing on the ground or on metal floors or working inside of metal tanks or boilers shall be grounded, except where such appliances are supplied through an insulating transformer with ungrounded secondary of not over 50 volts.

Electrical Instruments, Meters and Relays To Be Grounded

Par. 8625. The cases, frames, and other exposed metal parts of instrument transformers, instruments, meters, or relays which operate with their windings or working parts at more than 150 volts to ground shall be grounded unless they are isolated by elevation or protected by suitable barriers, grounded metal, or insulating covers or guards.

When mounted on switchboards having live parts on the front of panels, instrument, meter, and relay cases (whether operated from instrument transformers or connected directly in the circuit) shall not be grounded where operating with current-carrying parts not exceeding 750 volts to ground.

Non-Electrical Equipment to be Grounded

Par. 8626. Metal enclosures such as partitions, grill work, or similar enclosures, around equipment carrying voltages in excess of 750 volts between conductors, shall be grounded except in sub-stations and vaults under the sole control of the supply company.

Frames and tracks of electrically operated cranes, metal frames of non-electrically driven elevator cars to which electric conductors are attached, and hand-operated metal shifting ropes or cables of electric elevators shall be grounded.

SECTION 863

GROUNDING ELECTRODES

Water Piping as a Grounding Electrode

Par. 8630. A continuous metallic underground water piping system shall always be used as the grounding electrode where such piping system is available.

The point of attachment of a grounding conductor to a water piping system shall be on the street side of the water meter if in the building, or on a cold-water pipe of adequate current-carrying capacity, as near as practicable to the water-service entrance to the building or near the equipment to be grounded, and shall be accessible except by special permission. If the point of attachment is not on the street side of the water meter, the water piping system shall be made electrically continuous by bonding together all parts between the attachment and the pipe entrance which are liable to become disconnected, as at meters and service unions.

Artificial Grounding Electrodes

Par. 8631. Where a continuous underground water piping system is not available, the grounding connection shall be made in a manner to secure the most effective ground. Any one or combination of the following shall be used:

The metal frame of the building, if effectively grounded.

A continuous metallic underground gas piping system. The point of attachment of the grounding conductor shall be on the street side of the gas meter and shall be accessible where practicable.

A local metallic underground piping system, metal well casing, and the like.

An artificial ground whose electrode consists of a driven pipe, driven rod, buried plate, or other device approved for the purpose.

Any other grounding device approved by the National Board of Fire Underwriters and the Buildings Engineer.

Railway Tracks as a Grounding Electrode

Par. 8632. Rails or other grounded conductors of electric railway circuits shall not be used as a ground for other than railway lightning arresters and railway equipment, conduit, armored cable, metal raceway, and the like, if other effective grounds are available; and in no case shall such rails or other grounded conductors of railway circuits be used for grounding interior wiring systems other than those supplied from the railway circuit itself.

Size and Location of Artificial Grounding Electrodes

Par. 8633. Where artificial grounds are used the electrodes shall, as far as practicable, be embedded below permanent moisture level. Each buried-plate electrode shall present not less than 2 square feet of surface to exterior soil. Electrodes of plate-copper shall be at least 0.06 inch in thickness. Electrodes of iron or steel plates shall be at least ¼ inch in thickness. Electrodes of iron or steel pipe shall be galvanized and not less than ¾ inch internal diameter. Electrodes of rods of steel or iron shall be at least ¾ inch minimum cross-sectional dimension. Approved rods of non-ferrous materials or their approved equivalent used for electrodes shall be not less than ½ inch in diameter. Driven electrodes of pipes or rods, when of less than standard commercial length, shall preferably be of one piece and, except where rock bottom is encountered, shall be driven to a depth of at least 8 feet regardless of size or number of electrodes used. Where rock bottom is encountered at a depth of less than four feet, electrodes shall be buried in a horizontal trench, and if pipes or rods are used as the electrode, they shall be not less than eight feet in length. Such pipes or rods shall have clean metal surfaces and shall not be covered with paint, enamel, or other poorly conducting materials. Each electrode used shall be separated at least 6 feet from any other electrode, including those used for signal circuits, radio, lighting rods, or any other purpose.

Resistance Requirements for Grounding Electrodes

Par. 8634. Grounding electrodes shall have a resistance to ground not to exceed 25 ohms. If the resistance is not as low as 25 ohms, two or more electrodes connected in parallel shall be used.

Common Grounding Electrode for System and Equipment

Par. 8635. If buried or driven electrodes are used, the grounding conductor for conduit, cable armor, and other metallic raceway or wire enclosure, or for equipment, shall have its own grounding electrode, separate from the grounding electrode of the wiring system or the secondary distribution system supplying it, unless such distribution system has at least one additional ground at the transformer or elsewhere.

Grounding Electrode for Secondary Lightning Arrester

Par. 8636. The ground terminal of a lightning arrester on a secondary distribution system shall be grounded by connecting it to the grounded service conductor at service entrance, to the common grounding conductor, to the service equipment grounding conductor or to a separate grounding electrode.

Common Use of Grounding Electrodes for Lightning Rods

Par. 8637. Driven pipes or rods, buried plates, or other artificial electrodes used for grounding lightning rods, shall not be used as grounding electrodes for wiring systems, conduit, equipment, and the like.

SECTION 864

GROUNDING CONDUCTORS

General Requirements for Grounding Conductors

Par. 8640. When a non-conductive protective coating such as paint or enamel, is used on the equipment, conduit, couplings or fittings, such coating shall be removed from threads and other contact surfaces in order to insure a good metallic connection.

No switch or automatic overcurrent protective device shall be placed in any grounding conductor unless the opening of the switch or device disconnects all sources of energy.

Means of Grounding Fixed Equipment

Par. 8641. Metal boxes, cabinets and fittings, or non-current-carrying metal parts of other fixed equipment, if metallically connected to grounded cable armor or metal raceway, are considered to be grounded by such connection. If not so connected, the grounding method shall be one of the following:

By a grounding conductor run with circuit conductors in wire assemblies. This conductor may be uninsulated but if an individual covering is provided for this conductor, it shall be finished to show a green color.

By a separate grounding conductor installed the same as a grounding conductor for conduit and the like.

By special permission, other means for grounding fixed equipment may be used.

Electrical equipment secured to and in contact with members of the grounded structural metal frame of a building, shall be deemed to be grounded. Metal car frames supported by metal hoisting cables attached to or running over sheaves or drums of elevator machines shall be deemed to be grounded if the machine is grounded in accordance with this Code.

Equipment, metal raceways, or cable armor shall not be grounded by the use of the grounded circuit conductor of an interior wiring system.

Means of Grounding Portable Equipment

Par. 8642. The grounding method of the non-current-carrying metal parts of portable equipment shall be one of the following:

By means of the metal enclosure of the conductors feeding such equipment, provided an approved multi-prong plug or equivalent is used, one prong for the purpose of grounding the metal enclosure and provided further, that the metal enclosure is attached to the plug and to the equipment by connectors approved for the purpose.

By means of a grounding conductor run with the circuit conductors in wire assemblies, provided an approved multi-prong plug or equivalent is used one prong for the purpose of connecting such grounding conductor to the grounded metal raceway or cable armor. This conductor may be uninsulated but if an individual covering is provided for this conductor, it shall be finished to show a green color.

By means of a separate flexible wire or strap, insulated or bare, protected as well as practicable against mechanical injury.

Portable equipment shall not be grounded by the use of the grounded circuit conductor of an interior wiring system.

Grounding Conductors for Electric Circuits

Par. 8643. The grounding conductor of a wiring system shall be of copper or other corrosion-resistant material, insulated or bare. Except in case of bus bars, the grounding conductor shall be without joint or splice throughout its length. If the grounding conductor is not of copper, its electrical resistance per linear foot shall not exceed, and its tensile strength shall not be less than, that of the allowable copper conductor for such a purpose.

A grounding conductor, No. 4 or larger, may be attached to the surface on which it is carried without the use of knobs, tubes, or insulators. A grounding conductor smaller than No. 4 shall be enclosed in conduit, electrical metallic tubing, cable armor, or wooden raceway and such enclosures shall be continuous from the point of attachment to cabinets or equipment to the point of attachment to the grounding electrode and shall, except wooden raceways, be securely fastened to the ground clamp or fitting; except that a No. 6 conductor may be used without enclosure where run along the surface of the building construction and rigidly stapled in place and where it is free from exposure to mechanical injury.

Grounding Conductors for Equipment and Raceways

Par. 8644. The grounding conductor for equipment, and for conduit and other metal raceways or enclosures for conductors, shall be a wire, busbar, or other conductor, insulated or bare, or it shall be a rigid conduit, steel pipe or electrical metallic tubing, and under conditions favorable to corrosion the grounding conductor shall be of copper or other corrosion-resistant material.

Where a separate wire, bus bar, or other conductor is used as the grounding conductor for equipment, the installation shall comply with the requirements of Paragraph 8643. Where rigid metal conduit, steel pipe, or electrical metallic tubing is used, the installation shall comply with the requirements of Section 821.

If the grounding conductor for a lighting arrester is run in steel or iron pipe or raceway, it shall be bonded to the pipe or raceway at both ends.

Common Grounding Conductor

Par. 8645. The grounding conductor of an interior wiring system may be used also as the grounding conductor for equipment, conduit and other metal raceways or enclosures for conductors, including service conduit or cable sheath and service equipment.

Secondaries of current and potential instrument transformers having primary voltages exceeding 600, or the cases of instruments connected to such circuits, if grounded, shall not be connected with a grounding conductor used for other circuits or for conduit, equipment, and the like, but shall have an independent grounding conductor except where a general ground bus is provided.

Lightning rods shall not be used as grounding conductors for circuits, conduit, equipment, and the like.

Size of Grounding Conductor

Par. 8646. A grounding conductor for a direct-current supply system shall have a current-carrying capacity not less than that of the largest conductor supplied by the system and in no case less than that of No. 8 copper.

The grounding conductor for instrument cases and secondary circuits of instrument transformers shall not be smaller than No. 12 if of copper or, if of other metal, shall have equivalent current-carrying capacity.

The grounding conductor connected to the ground terminal of a lightning arrester located at the service entrance shall not be smaller than No. 6 copper and shall meet the same installation requirements as grounding conductors of interior wiring systems.

The size of the wire, rigid conduit, electrical metallic tubing, or steel pipe used as a grounding conductor for interior conduit, cable sheath or armor, and other metal raceways or enclosures for wires, and for equipment, shall be not less than given in the following table:

TABLE 8646T1

Rating or Setting of Automatic Overcurrent Device in Circuit Ahead of Equipment, Conduit, etc., Not Exceeding (Amperes)	Size of Grounding Conductor		
	Copper Wire No.	Conduit or Pipe (Inch)	Electrical Metallic Tubing (Inch)
30	14	½	½
60	10	½	½
100	8	½	½
200	6	½	1
400	4	¾	1¼
600	2	¾	1¼
800	0	1	2
1000	00	1	2
1200	000	1	2

The size of the wire, steel pipe, rigid conduit or electrical metallic tubing used as the grounding conductor for an alternating current system, for a common grounding conductor or for service raceways or service cable sheath or armor shall be not less than the following:

TABLE 8646T2

Size of Largest Service Conductor	Size of Grounding Conductor		
	Copper Wire No.	Conduit or Pipe (Inch)	Electrical Metallic Tubing (Inch)
No. 2 or smaller	8	½	½
1 or 0	6	½	1
00 or 000	4	¾	1¼
000 to 350,000 C. M.	2	¾	1¼
Over 350,000 to 600,000 C. M.	0	1	2
Over 600,000 to 1,100,000 C. M.	00	1	2
Over 1,100,000 C. M.	000	1	2

Conduit, pipe, or electrical metallic tubing shall not be used alone as the grounding conductor for a wiring system.

For grounding portable or pendent equipment, the conductors of which are protected by fuses or circuit-breakers rated or set at not exceeding 15 amperes, No. 18 copper wire may be used. For grounding portable or pendent equipment protected at more than 15 amperes, the tables of sizes for interior raceways and equipment shall be followed.

Isolated non-current-carrying metal parts of outline lighting systems may be bonded together by a No. 14 conductor protected from mechanical injury, if a conductor complying with the table of sizes for interior raceways and equipment is used to ground the group.

Methods of Making Ground Connecctions

Par. 8647. The grounding conductor shall be attached to circuits, conduits, cabinets, equipment, and the like, which are to be grounded by means of suitable lugs, clamps, blocks, or other approved means. Connections which depend upon solder shall not be used.

The grounding conductor shall be attached to the grounding electrode by means of an approved bolted clamp of cast bronze or brass or of plain or malleable cast iron to which the conductor is connected by the approved means specified above; or a pipe fitting, plug, or other approved device, screwed into the pipe or into the fitting; or other equally substantial approved means. Not more than one conductor shall be connected to the grounding electrode by a single clamp or fitting, unless the clamp or fitting is of a type approved for such use.

Ground Clamps

Par. 8648. For the grounding conductor of an interior wiring system the sheet-metal-strap type of ground clamp shall not be used, unless it has a rigid metal base seated on the water pipe or other electrode and the strap is of such material and dimensions that it is not liable to stretch during or after installation.

Ground clamps or other fittings, unless approved for general use without protection, shall be protected from ordinary mechanical injury by being placed where they are not liable to be damaged, or by being enclosed in metal, wood, or equivalent protective covering.

If the grounding electrode is also used for grounding lightning rods, as for example, in case of continuous metallic water pipe systems, the grounding connection shall be entirely independent of, and separated from, the lightning rod connection to the piping system or other electrodes. Refer to Paragraph 8637.

If two or more grounding conductors are used under a condition where, in accordance with the provisions of Paragraph 8645 a common grounding conductor is permissible, a common connection to the grounding electrode may be employed. In all other cases each grounding conductor shall have an independent connection to the grounding electrode.

Bonding Jumpers

Par. 8649. All bonding jumpers shall be of sufficient size to have current-carrying capacity not less than is required for the corresponding grounding conductor and shall be of copper or other non-corrodible metal. They shall be connected as provided in Paragraph 8647.

SECTION 865

INTERCONNECTION OF PRIMARY ARRESTER AND SECONDARY NEUTRAL

Solid Interconnection of Primary Arrester and Secondary Neutral

Par. 8650. The grounding conductor of a lightning arrester protecting a transformer which supplies a secondary distribution system may be interconnected with the grounded conductor of such secondary distribution system, provided the secondary has elsewhere a grounding connection to a continuous metallic underground water piping system in addition to the direct grounding connection at the arrester. Where there are at least four water pipe connections on the neutral, the direct grounding connection at the arrester may be omitted.

Interconnection of Primary Arrester and Secondary Neutral Through a Spark Gap

Par. 8651. Where the secondary is not grounded to a continuous metallic underground water piping system, but is otherwise grounded as required in Paragraph 8631, such interconnection, if made, shall be through a spark gap having a 60 cycle break-down voltage of at least twice the primary circuit voltage, but not necessarily more than 15 kv., and there shall be at least one other ground on the grounded conductor of the secondary that is at least 20 feet distant from the lightning arrester grounding electrode.

Interconnection of Primary Arrester and Secondary Neutral By Special Permission

Par. 8652. Except as provided in Paragraphs 8650 and 8651, interconnection of the primary arrester ground and the secondary neutral may be made only with the written permission of the Buildings Engineer.

CHAPTER 87

CIRCUITS AND EQUIPMENT OPERATING AT MORE THAN 600 VOLTS BETWEEN CONDUCTORS

Sec. 870—General Requirements for Circuits and Equipment Over 600 Volts.
Sec. 871—Conductors Over 600 Volts.
Sec. 872—Installation of Electric Apparatus Over 600 Volts.
Sec. 873—Control of Equipment Operating at More Than 600 Volts.
Sec. 874—Overcurrent Protection of Electrical Equipment Over 600 Volts.
Sec. 875—Overcurrent Protection of Electric Services Over 600 Volts.
Sec. 876—Guarding of Equipment Operating Over 600 Volts.

SECTION 870

GENERAL REQUIREMENTS FOR CIRCUITS AND EQUIPMENT OVER 600 VOLTS

Scope of Circuits and Equipment Over 600 Volts

Par. 8700. This Chapter shall apply to installations operating at more than 600 volts between conductors, except those of sign and outline lighting equipment, and X-ray and similar equipment, which installations shall comply with the requirements of Section 890 and Section 884, respectively.

Insulation of Equipment Over 600 Volts

Par. 8701. Conductors, devices, apparatus and equipment, operating at more than 600 volts, shall have an insulation or separation between parts of different potential and between live parts and the ground sufficient for the particular voltage employed.

Devices which break current shall have an interrupting capacity sufficient for the voltage and current employed.

Live parts shall be so arranged as to provide against accidental contact by unqualified persons.

Constant-Current Systems Over 600 Volts

Par. 8702. Elsewhere than in substations and transformer vaults, constant-current systems operating at more than 600 volts, shall not be installed in buildings.

Lamps and fixtures of constant-current systems shall not be attached to exterior walls of buildings unless the walls are of fire-resistive construction.

Indoor Substations Over 600 Volts

Par. 8703. Indoor industrial substations operating at more than 7500 volts, unless located in separate, detached buildings, shall comply with the requirements for vaults contained in Paragraphs 8367 to 8369, inclusive.

Electric Services Over 600 Volts

Par. 8704. Secondary conductors, not the primary conductors, when operating at more than 600 volts, are regarded as constituting the service conductors to the building proper in the following cases:

Where step-down transformers are located outdoors.

Where step-down transformers are located in a separate building from the one served.

Where step-down transformers are located in the building served, in a transformer vault conforming to the requirements of Paragraphs 8367 to 8369, inclusive.

The requirements for electric services and service equipment as contained in Section 832 shall apply, and the requirements of this Chapter are in addition.

Apparatus Over 600 Volts

Par. 8705. For motors operating at more than 600 volts, the requirements of this Chapter are in addition to or amendatory of the requirements contained in Section 834 and Chapters 85 and 86.

Transformers operating at more than 600 volts both in generating stations and substations, and in other buildings, shall comply with the requirements as contained in Section 836.

For capacitors operating at more than 600 volts, the requirements contained in Section 837 shall apply.

SECTION 871

CONDUCTORS OVER 600 VOLTS

General Requirements for Conductors Over 600 Volts

Par. 8710. Except in generator, transformer, switching and motor rooms, and in service runs, conductors carrying more than 600 volts, shall be in rigid metal raceways, duct, or armored cable specially approved for the voltage.

Circuits of more than 7500 volts between conductors shall be installed only in transformer vaults, substations, or motor rooms, enclosed by 2-hour fire-resistive construction, except as permitted for gas-tube signs in Section 890, and for X-Ray and high-frequency equipment in Section 884.

Service conductors shall enter the building as open conductors, in rigid metal raceways, or as multiple-conductor cable approved for the purpose. If the voltage exceeds 7500 volts, the conductors shall enter a transformer vault conforming with the requirements of Paragraphs 8367 to 8369, inclusive, except that when the service-entrance equipment consists of metal-enclosed switchgear not exceeding 15,000 volts between conductors, a vault is not required.

Conductors in conduit or duct and enclosed by concrete or brick not less than 2 inches thick shall be considered outside the building. Connections from such duct end to terminals of apparatus installed as permitted by Paragraphs 8364 and 8724 shall be as short as practicable and may be run in rigid conduit without covering of concrete or brick.

Requirements for Conductors Over 600 Volts

Par. 8711. Service conductors carrying over 600 volts, shall be not smaller than No. 6 unless in cable. Such conductors in cable shall be not smaller than No. 8.

Closely grouped open conductors with insulating covering subject to arcs or hot parts due to short-circuits in nearby conductors shall have a flame-retardant outer covering.

Open conductors outside of buildings shall have weatherproof covering or shall be bare. Conductors in raceways or cables outside of buildings shall be insulated with moisture-resistant material or shall be sheathed in lead.

Installation of Conductors Over 600 Volts Within Buildings

Par. 8712. If open work is employed, the conductors carrying over 600 volts, shall be supported on insulators of glass, porcelain, or other material approved for the purpose.

Open conductors shall be separated not less than 8 inches from each other, except at apparatus and devices.

Open conductors shall be not less than 2 inches from the surface wired over, and for voltages exceeding 2500, not less than 3 inches.

Open conductors and their supports, including insulators, shall have the strength and stability to insure maintenance of the required clearance in case of short-circuit current.

Where conductors emerge from a lead or metal sheath, they shall be protected from moisture and mechanical injury by a pothead or by other means which will give equivalent protection.

Concealed conductors shall be contained in rigid metal-raceways, or non-metallic raceways approved by the Buildings Engineer.

Conduits shall enter and be secured to the casing, shields or enclosures of apparatus or to terminal boxes bolted or otherwise secured to the casing, shield, or enclosure, except in generator, transformer, switching and motor rooms and in substations.

In conductors having lead sheaths, the sheath need not be continued over splices where moisture is not present, but the ends of the lead sheath shall be belled out and the sheath bonded around the splice by No. 6 copper wire and ground clamps.

Open insulated conductors shall have a flame-retardant outer covering which shall be stripped back one inch from the terminals so as not to touch them.

Installation of Conductors Over 600 Volts Outside of Buildings

Par. 8713. The requirements as contained in Paragraph 8295 shall govern the installation of conductors outside of buildings, operating at more than 600 volts between conductors.

SECTION 872

INSTALLATION OF ELECTRIC APPARATUS OVER 600 VOLTS

General Requirements of Installation of Electric Apparatus Over 600 Volts

Par. 8720. All apparatus operating over 600 volts shall be so located that the point from which they are operated is safely accessible to only qualified persons.

Installation of Electric Service Apparatus Over 600 Volts

Par. 8721. The location of service circuit-breakers, operating at more than 600 volts, shall be as required in Paragraph 8751.

Installation of Transformers Over 600 Volts

Par. 8722. The installation of transformers, operating at more than 600 volts, shall comply with the applicable requirements of Section 836.

The installation of potential transformers whose primaries operate at more than 5000 volts between conductors shall comply with the requirements of Paragraph 8724.

Installation of Motors Over 600 Volts

Par. 8723. Motors operating at more than 7500 volts between conductors shall be installed in fire-resistant motor rooms.

Installation of Switches, Circuit-Breakers and Control Apparatus Over 600 Volts

Par. 8724. Switches, circuit-breakers, and control and metering apparatus on circuits exceeding 5000 volts between conductors shall have a metal enclosure such as metal-clad switch-gear, trucks, and cubicles, or be installed remotely controlled in a fire-resistant switch-room or motor room or in a vault complying with the requirements of Paragraphs 8367 to 8369, inclusive.

Where live parts of equipment in such metal enclosures carry more than 600 volts and are accessible by means of a door, the door shall be provided with a lock so that it cannot be opened by unauthorized persons, or with an interlock which will prevent opening unless the parts thereby exposed are de-energized

Switches, circuit-breakers and control apparatus on circuits exceeding 15,000 volts between conductors shall be installed only in a vault complying with the requirements of Paragraphs 8367 to 8369 inclusive.

Installation of Oil Switches and Oil Circuit-Breakers Over 600 Volts

Par. 8725. Oil switches and oil circuit-breakers, operating at more than 600 volts, shall be isolated from other apparatus wherever practicable. When mounted in a closed compartment, means shall be provided to indicate whether the breaker is open or closed.

Installation of Isolating Switches Over 600 Volts

Par. 8726. Barriers shall be provided on both sides of air-break isolating switches, which operate at over 600 volts.

Installation of Fuses for 600 Volts

Par. 8727. Fuses or fusible cutouts in circuits operating at over 600 volts shall be so installed that the blowing of the fuse will not result in injury to persons or damage to other equipment.

SECTION 873

CONTROL OF ELECTRICAL EQUIPMENT OVER 600 VOLTS

Scope of Control of Electrical Equipment Over 600 Volts

Par. 8730. Paragraphs 8731 to 8733, inclusive, shall apply only to circuits and apparatus supplied through electric-service equipment operating at more than 600 volts. They shall not apply to equipment in vaults under the sole control of the supply company.

Separate Control of Electrical Equipment Over 600 Volts

Par. 8731. Each transformer or bank of transformers operating as a unit, and each other operating unit of apparatus, all operating at more than 600 volts, shall, except as provided in Paragraph 8732, be separately controlled.

Control of Step-Up or Step-Down Units Over 600 Volts

Par. 8732. When a generator and a transformer or a bank of transformers operate as a unit, at more than 600 volts, for increasing or decreasing the voltage, they may be controlled as a unit.

Series Trip Coil Over 750 Volts

Par. 8733. Series trip coils connected directly to the circuit, unless guarded or isolated by elevation, shall not be used with a panel or panel frame-mounted circuit-breakers, on circuits exceeding 750 volts.

Control of Electric Services Over 600 Volts

Par. 8734. For electric services over 600 volts, either the circuit-breaker specified in Paragraph 8750, or the alternatives permitted in Paragraph 8752, shall be considered to constitute sufficient disconnecting means.

The disconnecting means may be omitted from the secondary circuit when the requirements in Paragraph 8753 are complied with.

Air-break isolating switches shall be installed between switches or circuit-breakers used as service switches and the supply conductors, except where such equipment is mounted on removable truck panels or metal-clad switch-gear units, which cannot be opened unless the circuit is disconnected, and which, if removed from the normal operating position, automatically disconnects the circut-breaker or switch from all live parts.

When the fuses used with non-automatic breakers in accordance with Paragraph 8752 are of a type that may be operated as a disconnect switch, they may serve as the isolating switch if they completely disconnect the switch or circuit-breaker, and all service equipment from the source of supply.

Control of Motors Over 600 Volts

Par. 8735. The circuit-breaker or the fuses required in Paragraph 8741 shall constitute the disconnecting means for motors operating at more than 600 volts.

SECTION 874

OVERCURRENT PROTECTION OF EQUIPMENT OPERATING AT MORE THAN 600 VOLTS

Scope of Overcurrent Protection of Equipment Over 600 Volts

Par. 8740. The requirements contained in this Section shall apply only to circuits and apparatus operating at more than 600 volts, supplied through service equipment. They shall not apply to equipment in vaults under the sole control of the supply company.

General Requirements for Overcurrent Protection of Equipment Over 600 Volts

Par. 8741. Each transformer, or bank of transformers, operating as a unit at more than 600 volts, instrument transformers not included, and each other operating unit of apparatus, shall be protected from overcurrent by a manually-operable circuit-breaker which will interrupt all ungrounded conductors, except as provided in Paragraph 8742. Transformers operating in multiple, except two transformers of equal rating, shall be separately protected on both primary and secondary sides.

Potential instrument transformers shall be protected in the primary circuit by fuses rated at not more than 2 amperes, and if necessary an external resistor, in addition to fuses, shall be placed in series with the primary winding of a potential instrument transformer to limit the short-circuit current to a value that the fuses can safely interrupt.

Motor overcurrent protection shall consist either of a circuit-breaker, or of overcurrent units, integral with the controller, which shall simultaneously open all ungrounded conductors to the motor.

Motor branch circuit and feeder overcurrent protection shall consist of circuit-breakers or fuses. The voltage rating and capacity shall comply with the requirements of Paragraph 8742.

The number of overcurrent units for protection of circuits shall be as contained in table of Paragraph 8510.

Fuses for Circuits Over 600 Volts

Par. 8742. Oil-filled or other approved types of fuses may be used on circuits not exceeding 2500 volts to ground and rated at not more than 300 amperes, or not exceeding 7500 volts and 100 amperes, for the following purposes:

For the protection of individual feeder or branch circuits at the point where they receive their supply. When there is more than one such circuit, there shall be a manually-operable circuit-breaker between the point of origin of such circuits and the source of supply.

For the protection of individual transformers, or banks of transformers operating as a unit when such transformers are supplied by a common feeder, provided that such feeder is protected by a manually-operable or remote-control circuit-breaker at the point where it receives its supply. A circuit supplying a single transformer or bank of transformers need not have circuit-breaker protection.

For the protection of other classes of apparatus by special permission of the Buildings Engineer.

SECTION 875

OVERCURRENT PROTECTION OF ELECTRIC SERVICES OVER 600 VOLTS

General Requirements for Overcurrent Protection of Electric Services Over 600 Volts

Par. 8750. Overcurrent protection for electric services operating at more than 600 volts shall consist of automatic circuit-breaker with an overcurrent device in each ungrounded conductor, and so arranged that the operation of any one device will open all ungrounded conductors. For exceptions to this requirement, refer to Paragraph 8752.

Requirements for Service Circuit-Breaker Over 600 Volts

Par. 8751. The circuit-breaker for services operating at more than 600 volts, shall be located as near as possible to the point where the service conductors enter the building and shall be manually operable from a point which is readily accessible.

Provision shall be made so that the circuit-breaker is free to open in case the circuit is closed on an overload, and this shall be accomplished by means of a trip-free breaker.

Service circuit-breakers shall indicate clearly whether they are open or closed and shall be capable of interrupting the maximum short-circuit current to which they may be subjected.

Electrical Services Over 600 Volts In Vaults

Par. 8752. When the service equipment operating at more than 600 volts, is installed in a transformer vault, meeting the requirements of Paragraphs 8367 and 8369, inclusive, the overcurrent protection and disconnecting means may be as follows:

When the voltage is less than 25,000 volts between conductors, a non-automatic oil switch and suitable fuses may be used.

When the voltage to ground does not exceed 2500 volts and the current does not exceed 300 amperes, and when the voltage between conductors does not exceed 7500 volts and the current does not exceed 100 amperes, oil-filled or other fuses of a type that may be operated as a disconnecting means may be used without any switch or circuit-breaker.

Fuses used as permitted in this Paragraph shall have an interrupting rating at least equal to the maximum short-circuit current to which they may be subjected.

Electrical Equipment in Secondaries

Par. 8753. If the primary service equipment, operating at more than 600 volts, supplies one or more transformers whose secondary windings feed a single set of mains, and the primary circuit-breaker is manually operable from a point outside the transformer vault, the disconnecting means and overcurrent protection may be omitted from the secondary circuit, provided the setting of the primary circuit-breaker is such as to protect the secondary circuit.

Lightning Arresters for Electric Services Over 600 Volts

Par. 8754. A lightning arrester for electric services over 600 volts complying with the requirements of Section 894 shall be placed on each ungrounded overhead service conductor on the supply side of the service equipment, when called for by the Buildings Engineer.

SECTION 876

GUARDING OF EQUIPMENT OPERATING AT MORE THAN 600 VOLTS

General Requirements for Guarding of Equipment Over 600 Volts

Par. 8760. When accessible to unqualified persons, all current-carrying parts, including conductors, operating at more than 600 volts between conductors, shall be enclosed or isolated.

Isolation of Current-Carrying Parts of Equipment Over 600 Volts By Elevation

Par. 8761. To secure isolation by elevation of the current carrying parts of equipment operating at more than 600 volts, the distances above the floor or working surface shall be not less than that given in the following table:

TABLE 8761T

Voltage Between Phases	Minimum Vertical Clearance of Unguarded Parts
600	7 ft. 8 in.
2300	7 ft. 9 in.
6600	7 ft. 10 in.
11000	9 ft. 0 in.
22000	9 ft. 3 in.
33000	9 ft. 6 in.
44000	9 ft. 10 in.
66000	10 ft. 5 in.
88000	11 ft. 0 in.
110000	11 ft. 7 in.
132000	12 ft. 2 in.

Working Space for Current-Carrying Parts of Equipment Over 600 Volts

Par. 8762. Adequate working space shall be provided adjacent to current-carrying parts of equipment operating at more than 600 volts, upon which repairs or adjustments must be made while such parts are alive.

The clear space when removable guards are taken away shall be not less than that given in the following table:

TABLE 8762T

Voltage Between Phases	Minimum Horizontal Clearance of Unguarded Parts
600	3 ft. 2 in.
2300	3 ft. 3 in.
6600	3 ft. 4 in.
11000	3 ft. 6 in.
22000	3 ft. 9 in.
33000	4 ft. 0 in.
44000	4 ft. 4 in.
66000	4 ft. 11 in.
88000	5 ft. 6 in.
110000	6 ft. 1 in.
132000	6 ft. 8 in.

Where live parts are exposed on opposite sides of the working space, a clear space of not less than four feet shall be provided.

Rooms for Equipment Operating at Over 600 Volts

Par. 8763. Generator, switching, and motor rooms for equipment operating at over 600 volts shall be securely locked except while a qualified person is present.

Warning Signs for Equipment Over 600 Volts

Par. 8764. Unless isolating switches for equipment operating at more than 600 volts between conductors are so interlocked that they cannot be opened under load, signs shall be installed at isolating switches warning against opening them while they are carrying current.

CHAPTER 88

SOUND SYSTEMS, RADIO EQUIPMENT, AND X-RAY AND SIMILAR EQUIPMENT

Sec. 880—Sound Systems.
Sec. 881—General Requirements for Radio Equipment.
Sec. 882—Requirements for Antenna Systems.
Sec. 883—Grounding Conductors for Radio Equipment.
Sec. 884—X-Ray and Similar Equipment.

SECTION 880

SOUND SYSTEMS

Scope of Sound Systems

Par. 8800. This Section shall apply to installations of equipment and wiring used for sound-recording and reproduction, centralized distribution of sound, public address, speech-input systems and electronic organs.

General Requirements for Sound Systems

Par. 8801. Except as modified by this Section, wiring and equipment from the source of power to and between devices of sound systems connected to an interior wiring system shall comply with the requirements for the installation of a lighting or power system.

Conductors and equipment, other than power supply conductors and equipment, for public-address, speech-input, radio-frequency, audio-frequency systems, and amplifying equipment associated with radio receiving stations in centralized distribution systems, shall comply with the applicable requirements of Section 892 in addition to the requirements of this Section.

For overcurent protection requirements for such systems, refer to Paragraph 8536.

Number of Conductors in Raceways for Sound Systems

Par. 8802. The area of conductors for sound systems in a conduit or other raceway shall comply with Paragraph 8051, except that special permission may be granted for the installation of two two-conductor lead-covered cables in three-quarter inch conduit when the cross-sectional area of each cable does not exceed 0.11 square inch or in one-half inch conduit when the cross-sectional area of each cable does not exceed 0.048 square inch.

Wireways and Auxiliary Gutters for Sound Systems

Par. 8803. Wireways and auxiliary gutters for sound systems shall comply with the requirements of Section 823 with the following exceptions when used for sound-recording and reproduction:

Conductors shall not fill a wireway or gutter to more than 75 per cent of its depth.

Where the cover is subject to the moving of heavy objects it shall be of steel at least one-quarter inch in thickness and where not subject to moving of heavy objects, as in the rear of panels, it shall be at least No. 10 U. S. Standard gauge (0.140 inch).

Metal trough raceways may be installed in concealed places when run in a straight line between outlets or junction boxes. The covers of boxes shall be accessible.

Metal trough raceways made up in sections shall contain a grounding conductor to which each section shall be bonded.

Grouping of Conductors of Sound Systems

Par. 8804. Conductors of different sound systems grouped in the same conduit or other metallic enclosure or in portable cords or cables, shall comply with the requirements of this Paragraph.

Power-supply conductors shall be properly identified and shall be used solely for supplying power to the equipment to which the other conductors are connected.

Input leads to a motor-generator or rotary converter shall be run separately from the ouput leads.

The conductors shall be insulated individually, or collectively in groups, by insulation at least equivalent to that on the power-supply and other conductors, except where the power-supply and other conductors are separated by a lead sheath or other continuous metallic covering.

Flexible cords and cables shall be of types P, K, S, SJ, or other types specifically approved for the purpose for which they are to be used. The conductors of flexible cords, other than power-supply conductors, may be of a size not smaller than No. 26 provided such conductors are not in direct electrical connection with the power-supply conductors and are equipped with current-limiting means so that the maximum power under any condition will not exceed 150 watts.

Terminals shall be marked to show their proper connections. Terminals for conductors other than power-supply conductors shall be separated from the terminals of the power-supply conductors by a spacing at least as great as the spacing between power-supply terminals of opposite polarity.

Storage Batteries for Sound Systems

Par. 8805. Storage batteries for sound systems shall be installed in accordance with the requirements of Section 838. The battery leads shall be rubber-covered, Type R.

Equipment for Sound Systems

Par. 8806. Amplifiers and rectifiers shall be so located as to be readily accessible. They shall be suitably housed and of a type approved for the purpose except by special permission of the Buildings Engineer. Equipment used in hazardous locations shall be specifically approved for the purpose.

Amplifiers and rectifiers shall be so located as to provide sufficient ventilation to prevent undue temperature rise within the housing.

Amplifiers, rectifiers, loud-speakers and other equipment shall be so located or protected as to guard against mechanical injury such as might result in fire or personal hazard.

Grounding Requirements for Sound Systems

Par. 8807. Metal raceways for sound systems shall be grounded in accordance with the requirements of Chapter 86, except that where the raceway does not contain power supply wires, the grounding conductor need not be larger than No. 14 copper or its equivalent.

SECTION 881

GENERAL REQUIREMENTS FOR RADIO EQUIPMENT

Scope of Radio Requirements

Par. 8810. The requirements of Sections 881, 882 and 883, inclusive, shall apply to radio receiving equipment and to radio transmitting equipment but shall not apply to equipment and antennae used for coupling carrier current to power line conductors.

Except as modified by the requirements of Paragraphs 8802, 8803 and 8804, wiring and equipment from the source of power to and between devices connected to an interior wiring system shall comply with the requirements for the installation of a lighting or power system.

Conductors and equipmnent other than power supply conductors and equipment, for radio receiving equipment and radio transmitting equipment, and loud speakers, shall comply with Section 880.

Lightning Arresters for Receiving Stations

Par. 8811. Each conductor of a lead-in from an outdoor antenna of a receiving station, shall be provided with a lightning arrester approved for the purpose, except where the lead-in conductors from antenna to entrance to building are protected by a continuous metallic shield which is permanently and effectively grounded. Lightning arresters shall be located outside the building, or inside the building between the point of entrance of the lead-in and the radio set or transformers, and as near as practicable to the entrance of the conductors to the building. The lightning arrester shall not be located near combustible material, nor in a hazardous location.

Lightning Arresters for Transmitting Stations

Par. 8812. Except where protected by a continuous metallic shield which is permanently and effectively grounded, or the antenna is permanently and effectively grounded, each conductor of a lead-in for outdoor antenna of a transmitting station, shall be provided with a lightning arrester or a grounding switch or other suitable means which will drain static charges from the antenna system.

Interior Installation of Conductors for Radio Equipment

Par. 8813. Except as provided in Section 880, all radio wiring conductors inside the building shall be separated at least 4 inches from the conductor of any other light or signal circuit unless separated therefrom by conduit or some firmly fixed non-conductor, such as porcelain tubes or flexible tubing.

Transmitting Stations

Par. 8814. Transmitters shall comply with the following requirements:

Enclosing: The transmitter shall be enclosed in a metal frame or grille, or separated from the operating space by a barrier or other equivalent means, all metallic parts of which are effectually connected to ground.

Grounding of Controls: All external metallic handles and controls accessible to the operating personnel shall be effectually grounded. No circuit in excess of 150 volts shall have any parts exposed to direct contact.

Interlocks on Doors: All access doors shall be provided with interlocks which will disconnect all voltages in excess of 350 volts when any access door is opened.

Audio-Amplifiers: Audio-amplifiers which are located outside the transmitter housing shall be suitably housed and shall be so located as to be readily accessible and adequately ventilated.

Transformers and Capacitors: Transformers and capacitors which are a part of a radio transmitting station shall be considered as a part of the apparatus and shall not be required to conform to the requirements of Sections 836 and 837.

SECTION 882

REQUIREMENTS FOR ANTENNA SYSTEMS

General Requirements for Antenna Systems

Par. 8820. *Material:* Antenna, counter-poise and lead-in conductors shall be of hard drawn copper, bronze, copper-clad steel or other high-strength, corrosion-resistant material. Soft-drawn or medium-drawn copper may be used for lead-in conductors where the maximum span between points of support is less than 35 feet.

Supports: Outdoor antenna and counter-poise and lead-in conductors shall be securely supported. They shall not be attached to poles or similar structures carrying electric light or power wires or trolley wires of more than 250 volts. Insulators supporting the antenna or counter-poise conductors shall have sufficient mechanical strength to safely support the conductors. Lead-in conductors shall be securely attached to the antenna.

Clearance: Outdoor antenna, counter-poise and lead-in conductors from the antenna to a building shall not cross over the wires of electric light or power circuits and shall be kept well away from all such wires so as to avoid possibility of accidental contacts. Where in proximity to the conductors of electric light and power circuits of less than 250 volts, they shall be so constructed and installed as to provide a clearance of at least 2 feet to prevent accidental contact with such conductors.

Splices: Splices and joints in antenna and counter-poise span shall be made with approved splicing devices or by such other means as will not appreciably weaken the conductors. Soldering is permitted only when the splice or joint is without mechanical stress or strain.

Size of Antenna and Counter-Poise Conductors

Par. 8821. Outdoor antenna and counter-poise conductors for receiving and transmitting stations shall be of a size not less than given in the following respective tables:

TABLE 8821T1

RECEIVING STATIONS

Material	Minimum Size of Conductors When Maximum Open Span Length Is		
	Less than 35 feet	35 feet to 150 feet	150 feet and over
Hard-drawn copper	19	14	12
Copper-clad steel, bronze or other high strength material	20	17	14

TABLE 8821T2

TRANSMITTING STATIONS

Material	Minimum Size of Conductors When Maximum Open Span Length Is	
	Less than 150 feet	150 feet and over
Hard-drawn copper	14	10
Copper-clad steel, bronze or other high strength material	14	12

For exceptionally long spans, the size of the conductors shall meet with the approval of the Buildings Engineer.

Size of Lead-in Conductors for Radio Stations

Par. 8822. *Receiving Stations:* Lead-in conductors from outside antenna, and counter-poise for receiving stations, shall, for various maximum open span lengths, be of such size as to have a tensile strength at least as great as that of the conductors for antenna as specified in Paragraph 8821. When the lead-in consists of two or more conductors which are twisted together or are enclosed in the same covering or are concentric, the conductor size shall, for various maximum open span lengths, be such that the tensile strength of the combination will be at least as great as that of the conductors for antenna as specified in Paragraph 8821.

Transmitting Stations: Lead-in conductors for transmitting stations shall, for various maximum span lengths, be of a size at least as great as that of conductors for antenna as specified in Paragraph 8821.

Radio Conductors on Buildings

Par. 8823. *Receiving Stations:* Lead-in conductors attached to buildings shall be so installed that they cannot swing closer than 2 feet to the conductors of circuits of 250 volts or less, or 10 feet to the conductors of circuits of more than 250 volts; except in the case of circuits not exceeding 150 volts, if all conductors involved are supported so as to insure a permanent separation, the clearance may be reduced but shall not be less than 4 inches. The clearance between lead-in conductors and any conductor forming a part of a lightning rod system shall be not less than 6 feet.

Transmitting Stations: Antenna and counter-poise conductors for transmitting stations attached to buildings, shall be firmly mounted at least 3 inches clear of the surface of the building on non-absorptive insulating supports, such as treated pins or brackets, equipped with insulators having not less than 3-inch creepage and air-gap distances for transmitters having a licensed power of 1000 watts or less. For transmitters having a licensed power of more than 1000 watts, the clearance from the building and the creepage and air-gap distances, shall be sufficiently increased to be safe. Lead-in conductors attached to buildings shall also conform to these requirements, except when they are enclosed in a continuous metallic shield which is permanently and effectively grounded. In this latter case the metallic shield may also be used as a conductor.

Electric Conductors Used for Receiving Antenna

Par. 8824. When an electric supply circuit is used in lieu of an antenna, the device by which the radio receiving set is connected to the supply circuit shall meet with the approval of the Buildings Engineer.

Entrance to Building for Transmitting Lead-In Conductors

Par. 8825. Except where protected by a continuous metallic shield which is permanently and effectively grounded, lead-in conductors for transmitting stations shall enter buildings through a rigid, incombustible, non-absorptive insulating tube or bushing, through an opening provided for the purpose in which the entrance conductors are firmly secured so as to provide a clearance of at least two inches, or through a drilled window pane.

SECTION 883

GROUNDING CONDUCTORS FOR RADIO EQUIPMENT

General Requirements for Radio Grounding Conductors

Par. 8830. The grounding conductor for radio equipment shall, unless otherwise specified, be of copper, copper-clad steel, bronze, or other corrosion-resistant material.

The grounding conductors may be uninsulated.

The grounding conductors shall be securely fastened in place and may be directly attached to the surface wired over without the use of insulating supports.

The grounding conductor shall be protected where exposed to mechanical injury.

The grounding conductor shall be run in as straight a line as practicable from the equipment to the grounding electrode.

The grounding conductor shall be connected to a ground electrode according to the requirements of Paragraphs 8630 and 8631.

Size of Radio Protective Ground Conductor

Par. 8831. *Receiving Stations:* The protective grounding conductor for receiving stations shall be not smaller than No. 14 copper or No. 17 copper-clad steel or bronze, provided that where wholly inside the building it shall not be smaller than No. 18.

Transmitting Stations: The protective ground conductor for transmitting stations shall be as large as the lead-in, but not smaller than No. 14 copper, bronze, or copper-clad steel.

Size of Radio Operating Ground Conductor

Par. 8832. *Receiving Stations:* A single grounding conductor may be used for both protective and operating purposes.

When a single conductor is used, the ground terminal of the equipment shall be connected to the ground terminal of the protective device.

Transmitting Stations: The operating ground conductor for transmitting stations shall be No. 14 copper or its equivalent.

SECTION 884

X-RAY AND SIMILAR EQUIPMENT

General Requirements for X-Ray and Similar Equipment

Par. 8840. Wooden cabinets containing high-voltage parts of X-ray or similar equipment, shall be lined inside with approved incombustible material. The high-voltage parts shall have adequate spacing from walls of the cabinet. High-voltage equipment containing oil shall not be installed in wooden cabinets. Cabinets shall provide sufficient ventilation for safe operation of the equipment therein.

When one side of the high-voltage circuit is grounded, the milliammeter shall be connected in the grounded lead and need not be guarded.

Insulating floors, mats, or platforms shall be provided for operators in proximity to high-voltage parts. Floors of concrete or other conducting material shall be completely covered with linoleum or other insulating material lapped at joints and without the use of metal for securing in place.

X-Ray and similar equipment shall be grounded as required by Paragraphs 8622 and 8624.

Control Equipment for X-Ray and Similiar Equipment

Par. 8841. The low-voltage circuit of all X-ray and similar high-voltage equipment shall be provided with a manually-operable circuit-breaker having no exposed live parts. For mobile or portable equipment the circuit-breaker shall be located in or on the portable equipment, except that no circuit-breaker shall be required when the high-voltage parts, including the X-ray tube, are within the same metallic enclosure which is provided with a means for grounding.

In addition to the preceding requirements, the low-voltage circuit of X-ray apparatus of the radio-graphic type shall in all cases contain a switch which shall be so designed as to open automatically, except when held closed by the operator. In X-ray apparatus for use in therapy and industry a manual switch shall be provided to open and close the circuit at the operator's option.

Switches operated by foot pressure shall be provided with a shield over the contact button to avoid accidental closing, unless the equipment is of the fully-enclosed shock-proof type.

All operating parts such as spark-gap and regulating handles shall be made of insulating material, or adequately grounded where non-insulating material is used, and shall be operable from the outside of barriers.

When more than one piece of apparatus is operated from the same high-voltage source, each shall be independently controlled.

Transformers and Capacitors for X-Ray and Similar Equipment

Par. 8842. Transformers and capacitors which are a part of an X-Ray or similar apparatus shall be considered as a part of the apparatus and shall not be required to conform to the requirements of Sections 836 and 837.

Unless all current-carrying parts of capacitors, and of the conductors connected therewith, are at least 7 feet 6 inches from the floor and are inaccessible to unauthorized persons, or unless when within 7 feet 6 inches from the floor are within enclosures of grounded metal or insulating material, capacitors shall be provided with an automatic means for discharge and grounding the plates whenever the transformer primary is disconnected from the source of supply.

High-Voltage Wiring for X-Ray and Similar Equipment

Par. 8843. Overhead high-voltage stationary conductors for X-ray or similar equipment, shall not be less than 7 feet 6 inches from the floor unless guarded from contact.

High-voltage leads on fluoroscope tables shall be adequately insulated or provided with barriers which will guard against inadvertent contact.

Grounding Required for X-Ray and Similar Equipment

Par. 8844. High-voltage parts of X-ray or similar equipment within 7 feet 6 inches from the floor, including X-ray tubes and their leads, shall be protected against contact by barriers of grounded metal or by insulating material approved for the purpose.

Unless tube terminals and high-voltage leads are separated from the patient by grounded metal or insulating barriers, the terminals and conductors connected to them shall be insulated for a distance of 12 inches from the apparatus, and the leads shall be carried away from the patient as directly as practicable.

X-Ray tubes used in therapy shall be mounted in enclosures of grounded metal or insulating material approved for the purpose unless otherwise expressly permitted by the Buildings Engineer. Unless fully enclosed in cabinets or cases of grounded metal or of approved insulating materials, all high-voltage parts of generators, rectifiers, filters and cooling equipment shall be installed in a separate room or enclosure. Suitable arrangements shall be provided whereby the switch controlling the supply circuit to such equipment will necessarily be open, except while the door of such room or enclosure is locked from the outside.

Low-frequency current-carrying parts of machines of the quench-gap or open-gap type shall be insulated or guarded so that they cannot be touched during operation. This applies to all parts except the high-frequency circuit proper which delivers high-frequency current normally for therapeutic purposes.

CHAPTER 89

MISCELLANEOUS ELECTRICAL INSTALLATIONS

Sec. 890—Electric Signs and Outline Lighting.
Sec. 891—Systems Operating at Less Than 50 Volts.
Sec. 892—Electric Signal Systems.
Sec. 893—Electric Wiring for Organ Control.
Sec. 894—Lightning Arresters in Industrial Stations.
Sec. 895—Required Fire Alarm Systems.

SECTION 890

ELECTRIC SIGNS AND OUTLINE LIGHTING

General Requirements for Signs and Outline Lighting.

Par. 8900. The provisions of this section shall apply to the installation of conductors and equipment for signs and outline lighting.

All signs operating at over 600 volts shall be constructed in accordance with the regulations of this Code and with recognized electric sign standards. They shall be inspected while under construction in the manufacturer's shop and, if found to comply with the standard of the Underwriters' Laboratories, shall have their approved factory inspection label permanently attached to the sign.

All signs shall be marked with the maker's name, and for incandescent-lamp signs with the number of lampholders, and for gas-tube signs with input rating in amperes or volt-amperes. Transformers shall be marked with the maker's name, and transformers for gas-tube signs shall be marked with the input rating in amperes or volt-amperes, the input voltage and the open-circuit high-tension voltage. The marking of the sign shall be visible for inspection after installation.

Enclosure Requirements for Signs and Outline Lighting

Par. 8901. Sign boxes, cabinets, and outline troughs shall have all conductors and terminals, except the supply leads, enclosed.

Cutouts, flashers, and similar devices shall be enclosed in metal boxes having doors arranged so that they can be opened without removing obstructions or finished parts of the enclosure.

Switches for Signs and Outline Lighting

Par. 8902. Each outline lighting installation and each sign, when mounted on a building, shall be controlled by an externally-operable switch, mounted outside of the building within sight of the outline lighting or sign and so located that its function is obvious, or on the sign structure. The switch shall open all ungrounded conductors.

Doors or covers giving access to uninsulated parts of indoor signs or outline lighting exceeding 600 volts and accessible to the general public, shall either be provided with interlock switches which, on the opening of the doors or cover, disconnect the primary circuit, or shall be so fastened that the use of other than ordinary tools will be necessary to open them.

Switches, flashers, and similar devices controlling transformers shall be either of a type approved for the purpose, or have a current rating not less than twice the current rating of the transformers.

Branch Circuits for Signs and Outline Lighting

Par. 8903. Circuits for signs or outline lighting shall be so arranged that the number of outlets, lamps, and transformers connected to them shall in no case place more than 15 amperes on a branch circuit.

Wiring for Signs and Outline Lighting Operating at 600 Volts or Less

Par. 8904. Conductors in or on signs or for outline lighting operating at 600 volts or less, shall be installed in rigid metal conduit, flexible metal conduit, electrical metallic tubing, armored cable, or metal troughing. Type ACL armored cable shall not be used where subject to repeated bending. Conductors shall be of the rubber-covered types and, except in portable signs, shall be not smaller than No. 14. Where exposed to the weather, the conductors shall be lead-covered or other type specially approved for the conditions, except where rigid conduit, electrical metallic tubing, or enclosures are made rain-tight and arranged to drain.

For sign flashers the number of conductors in conduit or tubing shall be in accordance with Paragraph 8051.

Where the conductors are fastened to lampholders other than of the pin type, they shall be soldered to the terminals and the exposed parts of conductors and terminals shall be treated to prevent corrosion. Where the conductors are fastened to pin-type lampholders which protect the terminals from the entrance of water, and which are approved for sign use, the conductors shall be of the stranded type but need not be soldered to the terminals.

Lampholders shall be of the keyless porcelain or molded-composition type and shall be so constructed and installed as to prevent turning. Miniature lampholders shall not be employed for outdoor signs and outline lighting.

Wiring for Signs and Outline Lighting Operating at Over 600 Volts

Par. 8905. Conductors for signs or outline lighting operating at more than 600 volts, shall be installed as open work, as concealed conductors on insulators, or in rigid or flexible metal conduit or electrical metallic tubing. Conductors may be run from the ends of tubing to the grounded midpoint of transformers specifically designed for the purpose and provided with terminals at the midpoint. Where such connections are made to the transformer grounded midpoint, the connections between the high-voltage terminals of the transformer and the live ends of the tubing shall be as short as possible.

Conductors shall be of a type approved for the purpose and for the voltage of the circuit, and shall be not smaller than No. 14.

Sharp bends in the conductors shall be avoided.

Open conductors indoors shall be mounted on incombustible, non-absorptive insulators. Insulators of porcelain shall be glazed on all exposed surfaces. A separation of at least one and one-half inches shall be maintained between conductors and between conductors and other objects. Conductors shall not be located where subject to mechanical injury.

Concealed conductors on insulators shall be separated at least one and one-half inches from each other, and from all objects other than the insulators on which mounted. They shall be installed in channels lined with incombustible material and used for no other purpose, except that the primary circuit conductors may be in the same channel. The insulators shall be of incombustible, non-absorptive material.

If conductors hang freely in the air, away from combustible material, and if not subject to mechanical injury, as in some show-window displays, they need not be otherwise protected.

Conductors in rigid or flexible metal conduit or electrical metallic tubing shall be lead-covered if required by the Buildings Engineer. If the conductors are covered with lead or other metal sheathing, this covering shall extend beyond the end of the conduit and the surface of the cable shall not be injured where the covering terminates. The insulation on all conductors leaded and unleaded shall extend at least 4 inches beyond the end of the lead or the raceway, except for conductors at grounded midpoint terminals. Any single run of cable in metal raceway shall not exceed 20 feet where the voltage between the cable and the raceway is in excess of 5000 volts.

Open conductors outdoors shall be mounted on incombustible, non-absorptive insulators. Insulators of porcelain shall be glazed on all exposed surfaces. A separation of at least 2 inches shall be maintained between conductors and between conductors and other objects. Where subject to mechanical injury, or where within reach from ground, roof, or window, conductors shall be enclosed in raceways or suitably guarded. If guarded, a spacing of not less than 1½ inches shall be maintained between conductors and the enclosure unless the enclosure is non-conducting and incombustible.

Transformers for Signs and Outline Lighting

Par. 8906. The open-circuit voltage of transformer secondaries for signs or outline lighting, shall not exceed 15,000 volts with an allowance on test of 1000 volts additional.

Transformers shall be of a type approved for the purpose and, if exposed to the weather, shall be of the weather-proof type or be otherwise protected from the weather.

The high-voltage windings of transformers shall not be connected in series or parallel.

Transformers shall be accessible.

Tubing for Signs and Outline Lighting

Par. 8907. The tubing for signs or outline lighting shall be of such length and design as not to cause a continuous overvoltage on the transformer.

Tubing shall be adequately supported on incombustible, non-absorptive insulators, spaced not farther than four feet apart for window or exterior outline lighting, and so placed as to maintain a separation of not less than ¼ inch from metal parts, including barriers through which the tube passes. Tubing supports shall, if practicable, be adjustable.

The tubing shall be free from contact with inflammable material, and shall not be in contact with metal if the voltage exceeds 7,500.

The tubing shall not be located where normally exposed to mechanical injury.

Terminals and Receptacles for Gas Tubing for Signs and Outline Lighting

Par. 8908. The terminals of gas tubing for signs or outline lighting, shall be inaccessible to unqualified persons and isolated from combustible material and grounded metal. Such isolation shall be 1½ inches of air or non-absorptive, incombustible insulating material approved for the purpose. Terminals shall be relieved from stress by the independent support of the tubing.

Receptacles for gas tubing shall be of incombustible, non-absorptive insulating material and design approved for the purpose. Metal enclosures for terminals shall be of not less than No. 24 U. S. S. gauge sheet metal; enclosures of insulating material shall be incombustible non-absorptive and approved for the voltage of the circuit.

Where terminals enter an enclosure of an outdoor sign or of an indoor sign operating in excess of 7500 volts, a bushing of incombustible, non-absorptive insulating material shall be used unless receptacles are provided, or the sign is wired with bare wire mounted on approved supports which maintain the tubing in proper position. Where bare wiring is used, the conductor shall be not less than No. 14 solid copper, shall be supported so as to prevent sagging and lessening of the spacing required elsewhere in this Section, and shall have electrode terminal assemblies of an approved type supported not more than six inches from the electrode terminals.

In the exposed type of show-window sign, terminals shall be enclosed by receptacles approved for the purpose or, where hanging in air free from grounded surfaces, enclosed in sleeves of vulcanized fiber, phenolic composition, or other suitable material which overlaps all live parts by at least one-half inch.

Where a flexible, non-conducting seal is used to close the opening between the tubing and the receptacle or bushing, such seal shall not be in contact with grounded conductive material and shall not be depended upon for the insulation of the tubing.

Grounding of Signs and Outline Lighting

Par. 8909. Signs, troughs, tube terminal boxes and other metal frames wired for lighting, shall be grounded in the manner specified in Chapter 86 of this Code, unless they are insulated from ground and from other conducting surfaces and are inaccessible to unauthorized persons. This does not apply to signs of the portable incandescent lamp type. Isolated non-current-carrying metal parts of outline lighting may be bonded by No. 14 conductors and grounded in accordance with Chapter 86.

SECTION 891

SYSTEMS OPERATING AT LESS THAN 50 VOLTS

Scope of Systems Operating at Less Than 50 Volts

Par. 8910. This section shall apply to installations operating at less than 50 volts, direct or alternating current, except the signal systems, temperature control devices and similar systems, treated in Section 892, the wiring for organ control treated in Section 893, and the installation of required fire alarm systems treated in Section 895.

General Requirements for Systems of Less Than 50 Volts

Par. 8911. Conductors, devices, and equipment in systems operating at less than 50 volts, shall have current ratings sufficient for the greater current required to deliver equal power at the voltage lower than the usual voltages.

Conductor Sizes for Systems of Less Than 50 Volts

Par. 8912. Conductors in systems operating at less than 50 volts, shall be not smaller than No. 12, and for appliance branch circuits supplying more than one appliance or appliance receptacle they shall be not smaller than No. 10.

Branch Circuits for Systems of Less Than 50 Volts

Par. 8913. Not more than 8 lampholders or receptacles, nor a total load of more than 320 watts, shall be connected to a branch circuit of a system operating at less than 50 volts. Motors, appliances, or other equipment rated at more than 320 watts shall have a separate branch circuit.

Lampholders and Receptacles for Systems of *Less Than 50 Volts*

Par. 8914. Standard lampholders having a rating of not less than 660 watts shall be used in systems operating at less than 50 volts.

Receptacles shall have a rating of not less than 15 amperes except in kitchens, laundries, and other locations where portable appliances are likely to be used, where receptacles shall have a rating of not less than 20 amperes.

Batteries for Systems of Less than 50 Volts

Par. 8915. Batteries in systems operating at less than 50 volts, shall be located in rooms or spaces having adequate natural ventilation.

Battery jars and cells, unless composed of insulating material such as glass or hard rubber, shall be mounted on insulating supports of glass or porcelain.

Grounding Requirements for Systems of Less than 50 Volts

Par. 8916. The frames of engines and generators operating at less than 50 volts, are not required to be grounded.

One of the circuit conductors shall be grounded where conductors are run overhead between buildings, or when the circuit is supplied through a transformer from an ungrounded circuit or from a grounded circuit of more than 150 volts.

SECTION 892

ELECTRICAL SIGNAL SYSTEMS

Scope of Electric Signal Requirements

Par. 8920. The provisions of this section shall apply to electric circuits for transmitting information, including telephone, telegraph, district messenger, call bell, and similar circuits. Circuits carrying small currents at low voltage within the limits described in this section, used for other than signaling purposes, as for example, for temperature control devices, shall be considered as coming within the scope of this section.

Required Fire Alarm systems shall comply with the requirements of Section 895. However, fire alarm systems that are not required need not comply with the requirements of Section 895, but if they do not so comply, they shall comply with the requirements of this section.

Classification of Signal Systems

Par. 8921. Signal Systems shall be classified according to the operating voltage and maximum power as follows:

Class A—Systems in which the current, voltage, and power are not limited.

Class B—Systems operating at not more than 90 volts and fused at not more than 1 ampere and which are provided with current-limiting means other than fuses which will limit the power at a fault to not exceeding 150 volt-amperes.

Class C—Systems operating at not more than 60 volts and fused to limit the power at a fault to not exceeding 100 volt-amperes. When the rating of the fuse to meet this requirement, as computed from the actual operating voltage, is not a standard size, the next smaller standard size shall be used. When the power supply is from primary batteries or from transformers, or other devices approved for the purpose, having inherent current-limiting characteristics, the fuse may be omitted.

Installation of Class A Signal Systems

Par. 8922. Signal systems of Class A shall comply with all the requirements for the installation of a lighting or power system except that the number of outlets on a branch circuit shall not be limited.

Conductors for Class B and Class C Signal Systems

Par. 8923. Conductors for Class B Signal Systems installed inside of buildings shall be insulated with rubber not less than 1/32 inch thick unless they are in an approved cable. They shall not be smaller than No. 22 when in cable nor smaller than No. 19 when not in cable.

Conductors for Class C Signal Systems installed inside of buildings shall be not smaller than is required for the necessary current-carrying capacity by Paragraph 8050, and in no case smaller than No. 18.

On circuits for which protectors are required by Paragraph 8927, conductors from the last outdoor support to the protector and conductors attached to buildings shall have 1/32 inch rubber insulation on each conductor and in addition the conductors, either individually or bunched, shall be covered with a substantial braid. Where such conductors are entirely within a city block the insulation on each conductor may be less than 1/32 inch but not less than 1/40 inch in thickness. Other kinds of conductors approved for the purpose may be used.

Aerial cables of the metal-sheathed type shall have paper or other suitable insulation. Where the metal sheath is omitted each conductor shall have 1/32 inch rubber insulation and the bunched conductors shall be covered with a substantial braid. Other kinds of cables may be used only if approved for the purpose.

Installation of Class B and Class C Signal Systems on the Interior of Buildings

Par. 8924. Conductors of Class B or Class C Signal Systems extending from the protector to the equipment or where no protector is required shall be installed in accordance with the requirements of one of the wiring methods described in Chapter 82, except that the number of conductors in a raceway shall be limited only by the requirement that the cross-sectional area of all conductors shall not exceed 40 percent of the area of the raceway, or they may be fished in concealed spaces or secured to a surface by means of tacks, staples, or similar means, without any insulation or protection other than that on the conductors, provided the conductors closely follow the surface wired over.

Conductors of Class B or Class C Signal Systems shall not be placed in any raceway, compartment, outlet box, junction box, or similar fitting with conductors for light or power circuits unless the conductors of the two systems are separated by a partition; provided that this requirement shall not apply to conductors in such fittings where they are introduced solely for power supply to signaling equipment or for connection to remote-control equipment.

Conductors of Class B or Class C Signal Systems shall be separated at least 2 inches from any light or power conductors not in conduit unless permanently separated from the conductors of the other system by a continuous and firmly fixed non-conductor, additional to the insulation on the wire, such as porcelain tubes or flexible tubing.

Conductors bunched together in a vertical run shall have a fire-resistant covering capable of preventing the carrying of fire from floor to floor, except where conductors are encased in incombustible tubing or are located in a shaft enclosed by 2-hour fire-resistant walls having fire stops at each floor.

Installation of Class B and Class C Signal Systems on the Exterior of Buildings

Par. 8925. Open conductors of Class B or Class C Signal Systems attached to the exterior of buildings shall be separated at least 4 inches from light or power conductors not in conduit or cable, unless permanently separated from conductors of the other system by a continuous and firmly fixed non-conductor additional to the insulation on the wires, such as porcelain tubes or flexible tubing. Open conductors exposed to accidental contact with light or power conductors operating at over 250 volts, and attached to buildings, shall be separated from woodwork by being supported on glass, porcelain or other insulating material approved for the purpose.

On circuits for which protectors are required by Paragraph 8927, except when the protector is installed on the outside of the building or the entering conductors are in a cable, the conductors shall enter the building either through incombustible, non-absorptive insulating bushings, or through a metal raceway. Raceways or bushings shall slope upward from the outside or where this cannot be done drip loops shall be formed in the conductors immediately before they enter the building. Raceways shall be equipped with an approved service head. More than one conductor may enter through a single raceway or bushing.

Conductors of Class B or Class C Signal Systems shall not be run across or attached to roofs of buildings except small auxiliary buildings such as garages and the like, unless by special permission of the Buildings Engineer.

The metal sheath of aerial cables which are liable to contact with electric light or power conductors shall be grounded or shall be interrupted close to the entrance to the building by an insulating joint or equivalent device.

For the requirements for the installation of overhead signal conductors on poles, refer to Paragraph 8295.

Power Supply for Signal Systems

Par. 8926. Transformers or other devices supplying current to signal systems from electric light or power circuits shall be of a type approved for the purpose. Such transformers or other devices shall be enclosed in approved metal boxes and shall have separate overcurrent protection having a rating or setting as low as is practicable. The primary wiring shall comply with the requirements for other power equipment; the secondary wiring shall comply with the requirements of this Section.

Protectors Required for Classes B and C Signal Systems

Par. 8927. A protector approved for the purpose shall be provided for Class B or Class C Signal Systems, on each circuit, aerial or underground, so located as to be liable to accidental contact with light or power conductors operating at a potential exceeding 250 volts. Any circuit run partly or entirely in aerial wire or cable that extends beyond the city block in which the building served is located is considered as exposed to contact with circuits of higher voltage.

The protector shall consist of an arrester between each line conductor and the ground and a fuse in each conductor, the fuses protecting the arrester, all mounted on an incombustible, non-absorptive insulating base. The protector terminals shall be plainly marked to indicate "line", "instrument", and "ground".

Installation of Protectors for Signal Systems

Par. 8928. The protector for signal systems shall be located in or on the building as near as practicable to the point where the conductors enter. In the case of an underground entrance the protector may be located at the junction of the underground and the aerial wires.

The protector shall not be located in any hazardous location as defined in Section 840, nor in the vicinty of easily ignitible material.

The conductor for grounding the protector shall be not smaller than the circuit conductors or No. 18 copper. insulated with rubber at least 1/32 inch thick and covered with a substantial braid or it shall be of other types approved for the purpose. The grounding conductor shall be run in as straight a line as practicable to the grounding electrode and, where necessary, shall be guarded from mechanical injury.

The grounding conductor shall preferably be connected to a water pipe electrode. In the absence of a water pipe, connection may be made to a gas piping system, to metallic structures when effectively grounded, or to a ground rod or pipe driven into permanently damp earth. Steam or hot-water pipes shall not be employed as electrodes for protectors.

The grounding conductor shall be attached to a pipe electrode by means of a bolted clamp to which the conductor is soldered or otherwise connected in an effective manner. Where a gas pipe electrode is used, connection shall be made between the gas meter and the street main. In every case the connection to the grounding electrode shall be made as close to the earth as practicable.

SECTION 893

ELECTRIC WIRING FOR ORGAN CONTROL

Scope of Electric Wiring for Organs

Par. 8930. This section shall apply to those electric circuits and parts of electrically operated organs which are employed for the control of the sounding apparatus and keyboards.

Electronic organs shall comply with the appropriate provisions of Section 880.

Source of Energy for Organ Control

Par. 8931. The source of energy for organ control shall be a self-excited generator of not over 15 volts, or a primary battery.

The generator shall be effectively insulated from the ground and from the motor driving it, or both the generator and the motor frames shall be grounded in the manner prescribed in Chapter 86.

Conductors for Organ Control

Par. 8932. No conductor for organ control shall be smaller than No. 26 and the common-return conductor shall be not smaller than No. 14.

Conductors shall have rubber, asbestos, cotton, or silk insulation, except the common-return conductor which shall be rubber-covered; asbestos-covered, Type A; or slow-burning, Type SB. The cotton or silk may be saturated with parafine if desired.

Except the common-return conductor, and conductors inside the organ proper, the organ sections and the organ console, conductors shall be cabled. The common-return conductor shall be placed under an additional covering enclosing both cable and return conductor, or shall be installed as a separate conductor and may be in contact with the cable.

The cable shall be provided with one or more braided outer coverings, provided that a tape may be used in place of an inner braid. Unless installed in metal raceways the outer braid shall be flame-retardant or shall be covered with a closely-wound fireproof tape.

Installation of Conductors for Organ Control

Par. 8933. Cables for organ control shall be securely fastened in place and may be attached directly to the organ structure without insulating supports. Cables shall not be placed in contact with other conductors. Conduit may be used, but shall not be required.

Overcurrent Protection for Organ Control

Par. 8934. Circuits for organ control shall be so arranged that all conductors, except the main supply conductors and the common-return conductor, will be protected from overcurrent by an overcurrent device of not greater than 15 amperes rating.

SECTION 894

LIGHTNING ARRESTERS

Where Lightning Arresters Are Required

Par. 8940. Lightning arresters shall be provided in industrial stations where adequate protection against lightning is not otherwise provided.

Number of Lightning Arresters Required

Par. 8941. A lightning arrester shall be connected to each ungrounded overhead conductor entering or leaving the station, except that where there is more than one circuit, a single set of arresters may be installed on the station bus when means are provided to protect circuits that may remain disconnected from the bus.

Connection of Lightning Arresters

Par. 8942. The lightning arrester shall be connected on the line side of all connected station apparatus.

Choke coils are not required, but when used shall be installed between the lightning-arrester tap and the apparatus to be protected.

The connections between the arrester and the line wire or bus, and between arrester and ground shall be of copper wire or cable or the equivalent, and shall not be smaller than No. 6, and shall be made as short and as straight as practicable, avoiding as far as possible all bends and turns, especially sharp bends.

Insulation of Lightning Arresters

Par. 8943. Lightning-protection accessories such as gap electrodes, and choke coils when used, shall have an insulation from ground or from other conductors at least equal to the insulation required at other points of the circuit.

Isolating Switches for Lightning Arresters

Par. 8944. When isolating switches or disconnecting devices are used on lightning arresters, they shall withstand, in full open position a voltage test between live parts 10 per cent in excess of the maximum voltage test they will withstand to ground.

Location of Lightning Arresters

Par. 8945. Lightning arresters installed indoors shall be located well away from other equipment, passageways and combustible parts of buildings, and, when they contain a combustible liquid, shall be separated from other equipment by walls meeting the requirements of Paragraph 8368.

Where arresters containing a combustible liquid are located outdoors, provision shall be made to drain away any accumulation of the liquid. The liquid shall be drained away by ditches and drains or it shall be absorbed and danger of spreading removed by paving the yard with cinders or other absorbent material to a depth of several inches.

SECTION 895

REQUIRED FIRE ALARM SYSTEMS

Scope of Fire Alarm Systems

Par. 8950. The provisions of this Section shall apply to fire alarm systems when such systems are required in Part IV. Fire alarm systems that are not required need not comply with the requirements of this Section, but if they do not so comply, they shall comply with the requirements of Section 892.

General Requirements for Required Fire Alarm Systems

Par. 8951. The rating of the power supply and the sizes of conductors used with fire alarm systems shall be such that the voltage at the sounding devices is maintained sufficiently high to insure proper operation.

Each fire alarm system shall be equipped with a control panel expressly designed for the operation of the system with which it is to be used. The control panel shall be enclosed in a substantial metal cabinet having a door fitted with a glass panel not larger than is required for observation of derangement signals.

The individual pieces of equipment in a required fire alarm system shall be designed to operate harmoniously as a whole.

Wiring of Required Fire Alarm Systems

Par. 8952. Conductors for required fire alarm systems shall be not smaller than No. 14 and shall have a covering of rubber insulation not less than three sixty-fourths of an inch in thickness protected by substantial braid. Where conductors are installed underground or in other locations subject to moisture they shall be lead-covered or of other type specially approved for the conditions.

Conductors for required fire alarm systems shall be kept entirely independent of all other wiring and equipment, shall not enter the same raceway, box, cabinet, or other enclosure with other wiring, and shall not connect to any lamps, appliances, or apparatus not essential to nor a part of the fire alarm equipment.

In new buildings the conductors of required fire alarm systems shall be installed in rigid or flexible metal conduit or in electrical metallic tubing. In existing buildings they shall be installed in rigid or flexible metal conduit, electrical metallic tubing, surface metal raceways, or armored cable, or, where the operating voltage of the system is less than 50 volts, wood molding may be used.

Classification of Required Fire Alarm Systems

Par. 8953. Required fire alarm systems shall be classified as follows, according to the supervision required and the type of gong:

Class I—Closed circuit systems provided with supervision in accordance with the requirements of Paragraph 8954 and having single stroke gongs complying with the requirements of Paragraph 8955.

Where non-coded systems are required the signal shall be four rounds, a round consisting of three groups of four strokes each, irrespective of the station from which the alarm is sent.

Where coded systems are required the signal shall indicate the station from which the alarm is sent.

Where the pre-signal feature is required the initial coded alarm shall be sounded only in the locations designated in Part IV. Provisions shall be made so that authorized persons may send subsequent signals to sound a general alarm.

Where a silent alarm is required a coded signal shall be given on sounding devices of a type and size approved by the Buildings Engineer only in the locations designated in Part IV.

Class II—Open circuit systems having vibrating gongs complying with the requirements of Paragraph 8955 all of which ring continuously when any station is operated.

Supervision of Class I Fire Alarm Systems

Par. 8954. Class I fire alarm systems shall operate under constant electrical supervision which shall include all sounding devices, sending stations, relays, circuits, main power supply, and derangement signal power supply. The supervision shall be such that a short or open circuit in any device or circuit or a drop in voltage of more than 10 per cent of either power supply will cause the sounding of a derangement signal.

Derangement signaling devices shall be so arranged as to sound continuously except that silencing switches may be provided if, upon the operation of the switch, the derangement signal is positively and automatically transferred to either a lamp or buzzer signal located in the quarters of some person in authority, and if, when the trouble is cleared, the signal will again sound continuously until the silencing switch is returned to its normal position.

The current used for electrical supervision shall be sufficient to retain in normal condition all relays and other devices in a positive and reliable manner with a suitable factor of safety, and to prevent derangement by jars, shocks, or vibration.

Derangement signals shall be located where they will be heard by persons in authority.

Devices for regulating the flow of supervisory current shall be mounted on the control panel.

Sounding Devices for Required Fire Alarm Systems

Par. 8955. Sounding devices for fire alarm systems shall be so constructed and housed that dirt, moisture, vermin, or similar obstructions, will not interfere with the operation of the mechanism. They shall be mounted at least 8 feet above the floor where ceiling heights will permit and in other cases as near the ceiling as possible. Sounding devices shall be centrally located according to the area to be served and shall be spaced not more than 200 feet apart. There shall be at least one sounding device on each floor. Where necessary, sounding devices shall be adequately protected from mechanical injury.

Not more than 10 sounding devices shall be connected on any one circuit.

Fire alarm sounding devices shall be distinctive in pitch and quality from all other sounding devices used in the same area.

Sounding devices for a general alarm throughout the building in Class I systems shall be single-stroke gongs at least 10 inches in diameter; where conditions of occupancy are such that gongs are not readily heard, sirens or howlers may be used. Only one type of sounding device shall be used in a single floor or isolated sound area. Electro-mechanical gongs shall not be used. Sounding devices for pre-signal or silent alarms shall be of a type and size approved by the Buildings Engineer.

Sounding devices for Class II systems shall be vibrating gongs not less than 6 inches in diameter of a type without make-and-break contacts.

Sending Stations for Required Fire Alarm Systems

Par. 8956. Sending stations for fire alarm systems shall be so constructed and housed that dirt, moisture, vermin, or similar obstructions, will not interfere with the operation of the mechanism. They shall be mounted with the lower edge of the box not less than 4 feet 6 inches nor more than 6 feet above the floor. Sending stations shall be conspicuously located, readily accessible, and in the natural path of escape from fire. A sufficient number of stations shall be installed so that it shall not be necessary to travel more than 100 feet to reach a station. There shall be at least one station on each floor.

When the break-glass type of sending stations are used, they shall be provided with glass-breaking devices fastened directly to the stations. The use of chains for the required fastenings is prohibited.

All sending stations shall be finished in a bright red and shall have directions for operating in raised letters cast integral with the housing. The lettering shall be finished with a contrasting color.

Coded sending stations shall be either of the enclosed pull-lever or the break-glass-pull-lever type having the code number of the station plainly marked on a metal plate permanently secured to the front of the station. They shall send not less than four rounds of a definite code of signals to indicate the station from which the alarm is sent. The mechanism shall be so designed that when once started the proper transmission of a complete set of signals cannot be interfered with by again manipulating the starting device of that station. Non-interference stations may also be used.

Sending stations of the prewound type are prohibited.

Power Supply for Required Fire Alarm Systems

Par. 8957. The main power supply for Class I fire alarm systems shall be taken from the general supply to the premises or from storage batteries. Where the general supply is used, either directly or through transformers or rectifiers, the connection shall be made between the meter and the nearest switch or fuse. The fire alarm circuit shall have separate fuses which shall be labeled "Fire Alarm Fuses".

Where storage batteries are used, they shall be of the lead-plate sealed glass-jar type or of the alkaline type specially designed for such purpose; automobile batteries shall not be used. Adequate charging facilities shall be provided to maintain the batteries fully charged at all times.

The source of power for the derangement signals shall be either primary or storage batteries. Where lead-plate storage batteries are used, they shall be of the type previously described.

The power supply for Class II fire alarm systems shall be taken from the general supply to the premises, either directly or through transformers. The connection shall be made between the meter and the nearest switch or fuse. The fire alarm circuit shall have separate fuses which shall be labeled "Fire Alarm Fuses".

PART IX

MECHANICAL REGULATIONS

Chap. 91—ELEVATORS.
Chap. 92—POWER MACHINERY.
Chap. 93—BOILERS AND UNFIRED PRESSURE VESSELS.
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CHAPTER 91

ELEVATORS

Sec. 910—General Elevator Regulations.
Sec. 911—Hoistway Construction and Hoistway Guards.
Sec. 912—Electric Passenger Elevators.
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Sec. 914—Hydraulic Elevators.
Sec. 915—Hand and Gravity Elevators.
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Sec. 917—Cranes, Hoists and Conveyors.
Sec. 918—Special Elevators.

SECTION 910

GENERAL ELEVATOR REGULATIONS

Scope of Elevator Regulations

Par. 9100. These regulations shall apply to all elevators, escalators, cranes, hoists, conveyors, dumbwaiters, man lifts and similar equipment primarily used for lifting or lowering of persons or materials from one level to another. The operation, erection, installation and maintenance of hoisting and lowering equipment other than that covered by these regulations shall meet the approval of the Buildings Engineer.

Classification of Elevators, Hoists and Conveyors

Par. 9101. Elevators, hoists and conveyors are classified as follows:

- Electric passenger elevators.
- Electric freight elevators.
- Hydraulic and other power elevators.
- Hand gravity elevators.
- Escalators.
- Cranes, hoists and conveyors—
    - Cranes: Gantry, jib, pillar, traveling.
    - Hoists: Electric and pneumatic.
    - Conveyors: Apron, belt, bucket, gravity, pneumatic, screw, scraper.
    - Car unloaders.
    - Derricks.
    - Grab buckets.
    - Lifting magnets.
    - Telphers.
    - Winches and crabs.
- Dumbwaiters.
- Personal-service elevators.
- Stage, orchestra and organ-console elevators.
- Stairway lifts and invalid elevators.
- Man lifts.
- Builders' hoists.
- Automobile hoists.

Elevators, hoists and conveyors shall also be classified as registered and non-registered.

Registered elevators, hoists and conveyors include all power elevators; all hand and gravity elevators with a travel of more than 15 feet; all escalators, personal-service elevators, sidewalk elevators and open conveyors over 100 feet in length; all cranes and hoists with a capacity of more than 10 tons; all dumbwaiters with a floor area greater than 5 square feet or a lifting capacity of more than 150 pounds, and all stairway lifts, invalid elevators, and man lifts.

Non-registered elevators, hoists and conveyors include all hand and gravity elevators with a travel of not more than 15 feet; all conveyors 100 feet or less in length, or which are entirely enclosed and to which loads are automatically supplied; all cranes and hoists with a capacity of 10 tons or less and all grab buckets, lifting magnets, winches, crabs, telphers, dumbwaiters with a floor area of 5 square feet or less and a lifting capacity of not more than 150 pounds, builders hoists and automobile hoists.

Definitions for Elevators, Hoists and Conveyors

Par. 9102. *Automatic Operation* shall mean the operation by means of buttons or switches at the landings, with or without buttons or switches in the car, the momentary pressing of which will cause the car to start and automatically stop at the landing corresponding to the button pressed.

Auxiliary Power Elevator shall mean one having a source of mechanical power, such as shafting, in common with other machinery.

Bi-Parting Door or Gate shall mean a vertically sliding, horizontally sliding, or swinging door or gate consisting of two or more sections so arranged that the sections or pairs of sections open away from each other, and so interconnected that both sections operate simultaneously.

Bottom Clearance of the Elevator Car shall mean the vertical distance between any obstruction in the pit, exclusive of compensating devices, buffers, and buffer supports, and the lowest point on the understructure of the elevator car, exclusive of the safeties, car-frame channels, and guide shoes, when the car is level with the lower terminal landing.

Bottom Overtravel of the Counterweight shall mean the distance the counterweight can travel below its position when the car platform is level with the upper terminal landing until the full weight of the counterweight rests on the buffers. It includes the resulting buffer compression.

Bottom Overtravel of the Elevator Car shall mean the distance the car floor can travel below the level of the lower terminal landing until the weight of the fully loaded car rests on the buffers. It includes the resulting buffer compression.

Buffer shall mean a device designed to absorb the impact of the car or counterweight at the extreme limits of travel.

Builders' Hoist shall mean a temporary hoist used to convey material from one elevation to another.

Car Door or Gate shall mean a door or gate in or on the elevator car ordinarily used for entrance and exit.

Car Door or Gate Electric Contact shall mean a device the purpose of which is to open the control circuit, or an auxiliary circuit, when the car door or gate is moved from the closed position, thus preventing the operation of the elevator in a direction to move the car away from the landing.

Car Enclosure shall mean an enclosure, consisting of railings, walls, and top or cover, built upon the car platform.

Car Frame shall mean the supporting frame to which the car platform, upper and lower sets of guide shoes, and the hoisting cables are usually attached.

Car-Leveling Device shall mean any mechanism or control which will move the car within a limited zone toward, and stop the car at, the landing.

Car-Platform shall mean the structure which forms the floor of the car and directly supports the load.

Car or Counterweight Safety shall mean a mechanical device, attached to the car or counterweight frame, which will stop and hold the car or counterweight in case of predetermined overspeed, free fall, or through slackening of the cables.

Car-Switch Operation shall mean operation wherein the movement of the car is directly and solely under the control of the operator by means of a switch in the car.

Car-Switch Automatic Floor-Stop Operation shall mean an operation in which the stop is initiated by the operator from within the car with a definite reference to the landing at which it is desired to stop, after which the slowing down and stopping of the car is automatically effected.

Chain-Driven Machine shall mean an elevator machine connected to a reversible motor, engine or turbine by a chain.

Continuous-Presure Operation shall mean an operation by means of push buttons or switches in the car and at landings, any one of which may be used to control the movement of the car so long as they are manually held in the operating position.

Contract Load shall mean the load specified in the contract for the purchase of the elevator, or in the application for the permit.

Contract Speed shall mean the nominal speed specified in the purchase contract, or in the application for the permit, to be attained by the elevator in the up-direction with the contract load in the car.

Control of an Elevator shall mean a system of regulation by which the starting, stopping, direction of motion, acceleration, speed, and retardation of an elevator are governed.

Depth of Pit shall mean the vertical distance from the saddle of the lowest landing to the bottom of the pit.

Direct-Drive Machine shall mean an elevator machine in which the power is transmitted directly to the shaft on which the drum or traction sheave or sheaves are mounted without belts, chains or intermediate gears.

Door Closer shall mean a device, operated by gravity or other means, which will automatically close a door when released by the operator or by suitable automatic means.

Door Unit Electric Contact System shall mean a system of hoistway door or gate electric contacts.

Door Unit Interlock System shall mean a system of hoistway door interlocks.

Double-Belted Elevator shall mean an auxiliary power elevator in which the direction of motion is changed without reversing the prime mover.

Dual Operation shall mean a system of operation whereby the elevator is arranged to be operated automatically by means of landing and car buttons or switches, or manually by an operator in the car, who may either use a car switch or the buttons provided in the car. When operated by an operator, and upon the throwing of a suitable switch or switches, the landing buttons shall no longer operate the car, but may, however, be used to signal the operator that the car is desired at a certain landing.

Dumbwaiter shall mean a hoisting and lowering device used exclusively for freight, equipped with a car, which moves in guides in a vertical direction and which has a floor area not exceeding 9 square feet, a compartment height not exceeding 4 feet, and a capacity not exceeding 500 pounds.

Electric Elevator shall mean an elevator in which the motion of the car is produced by an electric motor connected directly to the elevator machine.

Elevator shall mean a hoisting and lowering device, other than a dumbwaiter, equipped with a car or platform which moves in guides in a substantially vertical direction.

Elevator Car shall mean the load-carrying unit, including its platform, frame and enclosure.

Elevator Landing shall mean that portion of a floor, balcony or platform used to receive and discharge passengers or freight.

Elevator Machine shall mean the machinery and its equipment used for raising and lowering the elevator car or platform.

Emergency Release shall mean a device the purpose of which is to make inoperative the door or gate electric contacts or interlocks in an emergency.

Escalator shall mean a moving, inclined, continuous stair or runway used solely for raising or lowering persons.

Final Terminal Stopping Device shall mean an automatic device for stopping the car and counterweight from contract speed, within the top clearance and bottom overtravel, independently of the operation of the normal terminal stopping device and the operating device.

Freight Elevator shall mean an elevator used to carry freight upon which only the operator and the persons necessary for loading and unloading are permitted to ride.

Full-Automatic Door or Gate shall mean a vertically-moving door or gate which is opened directly by the motion of the elevator car approaching any landing and closed by gravity as the car leaves any landing.

Geared-Traction Machine shall mean a traction machine which employs gearing between the electric motor and the traction sheave.

Gearless Traction Machine shall mean a traction machine which has the traction sheave and the brake drum mounted directly on the electric motor shaft.

Generator-Field Control shall mean a system in which control is primarily accomplished by the use of an individual generator for each elevator, in which the voltage applied to the hoisting motor is adjusted by varying the strength and direction of the generator field.

Gravity Elevator shall mean an elevator in which gravity is the source of power.

Hand Elevator shall mean an elevator driven by manual power.

Hoistway shall mean any shaftway, hatchway, well hole, or other vertical opening or space in which an elevator or dumbwaiter operates or is designed to operate.

Hoistway Door or Gate shall mean the hinged or sliding portion of the hoistway enclosure which gives access to the elevator at any landing.

Hoistway-Door or Gate Electric Contact shall mean a device the purpose of which is to open the control circuit, or an auxiliary circuit, when the hoistway door or gate at which the car is standing is moved from the closed position, thus preventing the operation of the elevator by the normal operating device in a direction to move the car away from the landing.

Hoistway-Door Interlock shall mean a device the purpose of which is:

> To prevent the operation of the elevator by the normal operating device in a direction to move the car away from a landing unless the hoistway door at that landing at which the car is stopping or is at rest is locked in the closed position.
>
> To prevent the opening of a hoistway door from the landing side, except by special key, unless the car is at rest within the landing zone at such hoistway door or is coasting through the landing zone with its operating device in the stop position.

Hoistway Electric Contact Unit System shall mean a system of hoistway door or gate electric contacts so arranged that the control circuit, or an auxiliary circuit, will be opened when any hoistway door is moved from the closed position.

Hoistway Enclosure shall mean any structure which separates the hoistway, either wholely or in part, from other parts of the building through which the hoistway extends.

Hoistway Unit Interlock System shall mean a system of hoistway-door interlocks which will also prevent the operation of the car by the normal operating device unless all hoistway doors are locked in the closed position.

Hydraulic Elevator shall mean an elevator in which the motion of the car is produced by liquid under pressure.

Invalid Elevator shall mean a power passenger elevator installed for, and used solely by, a person unable to climb stairs, with not more than one attendant.

Landing Zone shall mean a zone which extends not more than 18 inches above or below an elevator landing.

Man Lift shall mean a special appliance used for conveying persons from one elevation to another and which is not an elevator.

Multi-Voltage Control shall mean a system in which control is accomplished primarily by impressing successively on the armature of the hoisting motor a number of substantially fixed voltages such as may be obtained from multi-commutator generators common to a group of elevators.

Non-Selective Collective Automatic Operation shall mean an automatic operation by means of one button in the car for each landing level served and one button at each landing, wherein all stops registered by the momentary pressure of landing or car buttons are made irrespective of the number of buttons pressed or of the sequence in which the buttons are pressed. With this type of operation the car stops at all landings for which buttons have been pressed, making the stops in the order in which the landings are reached after the buttons have been pressed, but irrespective of its direction of travel.

Normal Terminal Stopping Device shall mean an automatic device for stopping the elevator car within the overtravel independently of the operating device.

Operation shall mean the method of actuating the control.

Operating Device shall mean the car switch, push button, rope, wheel, lever, treadle, and similar devices, employed by the operator to control the motion of the car.

Passenger Elevator shall mean an elevator used to carry persons other than the operator and the person or persons necessary for loading and unloading.

Personal-Service Elevator shall mean a special automatic-operation power passenger elevator used, or intended to be used, for personal or private purposes.

Platform Elevator shall mean an elevator the platform of which is suspended or sustained at three or more points by suspension members which are relied upon to maintain the platform substantially level.

Plunger Elevator shall mean a hydraulic elevator having a ram or plunger directly attached to the underside of the car platform.

Power-Closed Door or Gate shall mean a door or gate which is opened manually and closed by power other than that produced by hand, gravity, springs, or the movement of the car.

Power Elevator shall mean an elevator in which the motion of the car is produced by the application of energy other than that obtained from hand power or gravity.

Power-Opened, Self-Closing Door or Gate shall mean a door or gate which is opened by power, other than that produced by hand, gravity, springs, or the movement of the car and, when released by the operator, is closed by energy stored during the opening operation.

Power-Operated Door or Gate shall mean a door or gate which is opened and closed by power other than that produced by hand, gravity, springs, or the movement of the car.

Power-Operated Door or Gate, Automatically Opened, shall mean a door or gate which is opened by power other than that produced by hand, gravity, springs, or the movement of the car, the opening of the door being initiated by the arrival of the car at or near the landing. The closing of such door or gate may be under the control of the elevator operator or may be automatic.

Power-Operated Door or Gate Device shall mean a device, or assemblage of devices, the purpose of which is to open and close the hoistway door and car door or gate by power other than that produced by hand, gravity, springs, or the movement of the car.

Power-Operated Door, Gate, Manually Controlled, shall mean a door or gate which is opened and closed by power other than that produced by hand, gravity, springs, or the movement of the car, the door movement in each direction being controlled by the elevator operator.

Pre-Register Operation shall mean an operation in which signals to stop are registered in advance by buttons in the car and at the landings. At the proper point in the car travel the operator in the car is notified by a signal, visual, audible, or otherwise, to initiate the stop, after which the landing stop is automatic.

Rheostatic Control shall mean a system in which control is accomplished primarily by varying resistance or reactance in the armature or field circuit of the hoisting motor.

Rope-Geared Hydraulic Elevator shall mean an elevator in which the motion of the car is produced by multiplying the travel of a piston or ram by a system of sheaves over which the hoisting ropes operate.

Selective Collective Automatic Operation shall mean an automatic operation by means of one button in the car for each landing level served and by "UP" and "DOWN" buttons at the landings, wherein all stops registered by the momentary pressure of the car buttons are made as defined under non-selective collective automatic operation, but wherein the stops registered by the momentary pressure of the landing buttons are made in the order in which the landings are reached in each direction of travel after the buttons have been pressed. With this type of operation, all "UP" landing calls are answered when the car is traveling in the "UP" direction and all "DOWN" landing calls are answered when the car is traveling in the "DOWN" direction, except in the case of the uppermost or lowermost calls, which are answered as soon as they are reached, irrespective of the direction of travel of the car.

Self-Closing Door or Gate shall mean a door or gate which is opened manually and which closes when released.

Semi-Automatic Door or Gate shall mean a door or gate which is opened manually and closed automatically as the car leaves the landing.

Sidewalk Elevator shall mean a freight elevator which has a hatch opening located either partially or wholly outside the building and which has no opening into the building at its upper terminal landing.

Signal Operation shall mean an operation by means of single buttons and switches in the car, and up-and-down direction buttons at the landings, by which predetermined landing stops may be set up or registered for an elevator or for a group of elevators. The stops set up by the momentary pressure of the car buttons are made automatically in succession as the car reaches those landings, irrespective of its direction of travel or the sequence in which the buttons are pressed. The stops set up by the momentary pressure of the up-and-down buttons at the landing are made automatically by the next car in the group approaching the landing in the corresponding direction, irrespective of the sequence in which the buttons are pressed. With this type of operation the car can be started only by means of a starting switch or button in the car.

Single Automatic Operation shall mean an automatic operation by means of one button in the car for each landing level served and one button at each landing, so arranged that if any car- or landing-button has been pressed the pressure of any other car or landing operating button will have no effect on the operation of the car until the response to the first button has been completed.

Single-Belted Machine shall mean an elevator machine connected to a reversible motor, engine or turbine by a belt.

Spur-Geared Machine shall mean an elevator machine in which the power is transmitted to the driving sheaves or drum through spur gearing.

Stairway Lift shall mean a power operated device installed on an existing stairway in a private residence for, and used solely by, a person unable to climb stairs and not more than one attendant.

Top Clearance of the Elevator Car shall mean the distance the car floor can travel above the level of the upper terminal landing without any part of the car or devices attached thereto coming in contact with the overhead structure.

Top Clearance of the Elevator Counterweight shall mean the shortest vertical distance between any part of the counterweight structure and the nearest part of the overhead structure or any other obstruction when the car floor is level with the lower terminal landing.

Top Overtravel of the elevator car shall mean the distance provided for the car floor to travel above the level of the upper terminal landing before the car is stopped by the normal terminal stopping device.

Traction Machine shall mean an elevator machine in which the motion of the car is produced by friction between the hoisting ropes and the traction sheave.

Travel of an elevator or dumbwaiter shall mean the vertical distance between the bottom terminal landing and the top terminal landing.

Winding-Drum Machine shall mean an elevator machine in which the cables are fastened to and wind on a drum.

Worm-Geared Machine shall mean one in which the power is transmitted to the driving sheaves or drum through worm gearing.

Drawings for Elevators, Hoists and Conveyors

Par. 9103. The owner or person responsible for the installation of an elevator, hoist or conveyor shall file with the Buildings Engineer drawings in duplicate, showing the location of the machinery and equipment. Such drawings shall also show the contract load and car speed; the safe-lifting capacity, if any; the weight of the car complete; the car operating device; the type and make of hoistway door interlocks and contacts; the type of normal and final stopping devices; the diameter of sheaves; the size, number and material of the hoisting and counterweight cables; the type of speed governor; the type of car and counterweight safeties; the overhead and pit clearances; the type of buffers; the machine and overhead grating; the weight of the machine if overmounted; the material, type and spans of overhead supporting members; the reaction of loads on overhead supporting members; the type of shaftway gates or doors and car gates or doors; and any other information which may be required by the Buildings Engineer.

Tests for Elevator Interlocks and Electric Contacts

Par. 9104. The required tests of interlocks and electric contacts shall be as follows:

A. *Endurance Test:* The interlocking device, with initial lubrication and adjustment only, shall complete 100,000 cycles of operation without failure of any kind or evident indication of approaching failure. If the interlocking device is not a complete and separate unit for each hoistway door, that portion of the interlocking device which functions on every unlocking operation, such as a master switch, shall complete 400,000 additional cycles of operation, or a total of 500,000 cycles, without failure of any kind or evident indication of approaching failure.

B. *Current-Interruption Test:* During Test "A", Endurance Test, 1000 cycles of the operation of the device shall be performed while the contact within the device is making and breaking an electrical circuit.

C. *Test in Moist Atmosphere:* Preliminary to this test the device shall be given a wearing-in run of 10,000 cycles of operation while fully lubricated, after which the interlocking device, except self-lubricating bearings and bearings of a type not requiring frequent replenishment of lubricant, shall then be taken apart and freed of lubricant by washing in gasoline. The device, after re-assembling, then shall be subjected continuously in a closed hoistway to an atmosphere saturated with a 3.5 per cent solution of sodium chloride for 72 consecutive hours, and operated for 10 consecutive cycles at the end of each of the first two 24-hour periods, and allowed to stand during the remaining 24-hour period after which it shall not fail in a manner to create an unsafe condition. After having been lubricated it shall then, without adjustment and without further attention, complete 15,000 cycles of operation without failure of any kind or evident indication of approaching failure.

D. *Test Without Lubricant:* Preliminary to this test the device shall be given a wearing-in run of 10,000 cycles of operation while fully lubricated. The interlocking device shall then be taken apart and all bearings, except self-lubricating bearings and bearings of a type not requiring frequent replenishment of lubricant, freed of lubricant by washing in gasoline, and shall, after re-assembling without other than the usual initial adjustment, that is, without adjustment especially made to meet the conditions of this particular test, and without further attention, complete 25,000 cycles of operation without failure of any kind or evident indication of approaching failure.

E. *Misalignment Test:* The device shall operate successfully—

1. When the car-cam or other equivalent operating mechanism used in making the test, has been displaced horizontally from its normal position, that is, the position it was in when the device under test was installed, as follows:

   a. In a direction perpendicular to the edge of the landing:
      Backward, one-quarter inch.
      Forward, one-quarter inch.

   b. In a direction parallel with the edge of the landing:
      To the right, one-quarter inch.
      To the left, one-quarter inch.

2. When the bottom of the hoistway door has been displaced horizontally from its normal position, as follows:

   a. In a direction perpendicular to the edge of the landing:
      Backward, one-quarter inch.
      Forward, one-quarter inch.

3. When the top of the hoistway door has been displaced horizontally from its normal position, as follows:

a. In a direction perpendicular to the edge of the landing:

Backward, one-eighth inch.
Forward, one-eighth inch.

For types of doors and mountings, other than the horizontally sliding door with the usual type of door hangers and door guides on the landing, equivalent misalignment tests shall be made appropriate to the position in which the door lock is mounted and to the path of travel of the door as it approaches the lock to effect the interlocking action.

F. *Insulation Test:* The insulation of electrical parts shall be subjected to a 60-cycle effective voltage twice the rated voltage plus 1000 volts, applied for one minute, without failure of any kind.

G. *Force and Movement Test:* If the interlock is of the type which is released by a car-cam, the force required to release the interlock and the movement of the element engaged by the cam, shall be measured before and after Test A, Endurance Test. The force recorded in each test shall be the maximum, measured in a horizontal plane, which must be applied to that member of the interlock which is directly actuated by the cam, to release the door-locking member of the interlock from locking engagement. The movement recorded shall be the distance, vertically projected on a horizontal plane, which the member of the interlock that is directly actuated by the cam travels from its position when the cam is retired and the door locked to its position when the door-locking member is first released from locking engagement. The force and movement readings shall be determined with the interlock mounted in its normal position, as specified by the manufacturer. The test certificate shall state the average of the recorded forces and movements.

Hoistway-door interlock devices shall be examined with respect to their proper performance of the prescribed functions at temperatures from 25 to 140 degrees Fahrenheit (-4 to 60 Centigrade). Where the functioning of any such device might be affected by a change of temperature, and coefficients of thermal expansion of the affected parts are known or measured, the effect of temperature may be computed and tests need not be carried out at more than one temperature.

For interlocks employing a single switch operated by a wire or tape to protect several hoistway doors, the master switch shall be marked with the physical properties of the wire or tape used, and the certificate of approval shall cover the allowable maximum length of tape or wire of a given material which may be used with the device.

During tests A, B, C and D, interlocks shall have electrical parts connected in a non-inductive electric circuit having a constant resistance, in which a current of 2 amperes from a source of 220 volts d.c. is flowing. During the tests A, C, and D the electric circuit shall be closed but shall not be broken at the contact within the device on each cycle of operation.

A separate device shall be used in each of Tests A, C and D. If an electric contact which has been approved as a part of a door interlock, or as a door or gate electric contact, is submitted for test as part of another interlock, the electrical tests need not be repeated. Retiring cams or equivalent devices for operating interlocks need not be tested.

Tests for Car and Counterweight Oil Buffers

Par. 9105. The required tests of car and counterweight oil buffers shall be as follows:

1. *Retardation Test:* The buffer shall be installed upon a suitable foundation so that the axis of the cylinder is vertical. It shall be filled with oil provided by the manufacturer. An elevator car of suitable size shall be dropped freely in its guides upon the buffer from two different heights, as specified in Table 9105T.

TABLE 9105T

Test	Drop, i. e. bottom of car to striker or top of buffer	Total Load in Pounds, i. e. weight of car plus loading
A	S **	1. Manufacturer's rated minimum 2. Manufacturer's rated maximum 3.* 110% manufacturer's rated maximum
B	0.51S, for buffer strokes under 24″ 0.56S, for buffer strokes from 24″ to 30″ 0.64S, for buffer strokes exceeding 30″	1. Manufacturer's rated minimum 2. Manufacturer's rated maximum 3.* 110% manufacturer's rated maximum

* This is equivalent to approximately 20 per cent increase in car capacity.

** S is such a distance that the maximum velocity attained by the car during the buffer compression shall be equal to the governor tripping speed for which the buffer is rated.

The travel of the car shall be recorded accurately by means of a drum chronograph or by photographing a carefully calibrated tape. The error in the time reading by either method shall not exceed 0.005 seconds.

From the time-travel curve, the velocity and the retardation of the car shall be computed and plots made of the car travel, car velocity, and car retardations. Original test data shall be available to the manufacturer.

No retardation peak having a duration greater than one twenty-fifth second shall exceed 80.5 feet per second per second for tests A-1 and A-2 and B-1 and B-2. Results of A-3 and B-3 shall be recorded for the purpose of detecting any abnormal performance. Upon completion of these tests no part of the buffer shall show any deformation or injury.

2. *Oil-Leakage Test:* This test shall be made simultaneously with the retardation test. The oil level in the buffer when filled prior to test shall first be carefully marked. At the completion of the six retardation tests, in each of which the car shall have remained on the fully compressed buffer for a period of 5 minutes, the buffer shall be allowed to stand one-half hour in the fully extended position to permit the return of oil to the reservoir and to permit the escape of any entrained air, after which the oil level shall again be measured. This oil level shall in no case be more than 1/16 inch lower than the level at the start of the test for each foot of buffer stroke.

3. *Churning Test:* The time of the buffer stroke after the car has dropped a distance equivalent to the stroke of the buffer shall first be determined either from the photographic or chronograph record or by means of an automatic timer. The end of the stroke for this purpose may be taken as the point at which the last oil port in the buffer is shut off by the piston in its downward travel. Any automatic timing device shall be accurate, have minimum possible lag, and be capable of being read to 0.01 second.

The car shall then be run on to the buffer, with cables attached, at approximately one-half the velocity attained in Test B, of the Retardation Test, at intervals of one minute until 10 such strokes have been made. The oil shall then be examined for foam. No oil foam shall appear on the outside of the buffer following this test. Upon completion of the 10 strokes at one-half speed another free fall equivalent to the buffer stroke shall be made immediately and the time of the stroke taken. The time of this second free-fall test shall be at least 75 per cent of that of the drop test made prior to churn.

4. *Plunger-Return Test:* When the load is lifted off the plunger, the time required for the plunger to return to its fully extended position shall be measured. If this time exceeds 90 seconds, the manufacturer shall be asked to submit either a duplicate buffer or a new pressure cylinder and piston, upon which equipment a second test shall be run. If the plunger-return time again exceeds 90 seconds, the buffer shall be rejected.

5. *Test of Lateral Movement of Plunger:* With the buffer casing clamped or otherwise securely fastened to a firm base, the lateral movement of the top of the plunger shall be accurately measured, the plunger head being moved from its extreme right to its extreme left position in a vertical plane. This total movement shall be divided by 2 to determine the movement from the vertical position. This movement from vertical shall not exceed 1/16 inch per foot of buffer stroke.

Prohibited Elevator Installations

Par. 9106. The following types of arrangements of elevators shall not be installed in any building or structure:

a. Passenger elevators or power-freight elevators with cars counterbalancing each other.

b. Floating platform elevators.

c. Platform elevators.

d. Elevators operating through automatic hatch covers, except sidewalk elevators.

e. Belt-driven and chain-driven elevators.

Existing Elevators, Hoists and Conveyors

Par. 9107. Existing elevators, hoists and conveyors shall be made to conform to this Code if they were installed prior to the passage of this Code without conforming to the requirements in force at the time of installation or if the kind of service is changed or if they are altered, except to replace existing parts or to change the type of operating electric current.

Every existing elevator of direct, single-belted, or single-chain drive type shall be provided with electrically released breaks, terminal stopping devices, and other safety features required for electric freight elevators.

Every existing elevator of double-belted type shall be permitted to operate only when driven from a line shafting which supplies power for other purposes and when provided with means to stop the elevator belts without stopping other machinery driven from the same source of power.

The brakes of every existing belted or chain-driven elevator shall be applied directly to the hoisting machine and shall be arranged to apply automatically in case the driving belt or chain breaks or becomes disengaged.

Where it is desired to use existing freight elevators for carrying passengers, such elevators shall be reconstructed to conform to the requirements for passenger elevators.

Car safeties shall be periodically inspected and tested as at such times as are required for other inspections and tests in Section 162, to determine the condition of the sliding surfaces and the working parts. These tests shall be made at contract speed with a load of not less than 150 pounds nor more than contract load in car, at the discretion of the Buildings Engineer, to determine if the device is in operating condition.

Maintenance and Operation of Elevators

Par. 9108. Freight elevators shall have legible signs posted in the car and at each landing prohibiting unauthorized persons from riding in or on the elevator car. These signs shall have letters not less than one inch high.

Cables, guides and machinery for elevators shall be kept well lubricated.

A wire or other current-carrying device shall not be substituted for the proper fuse or circuit-breaker in an elevator circuit.

Pressure and discharge tanks of hydraulic elevators shall be thoroughly cleaned, internally inspected and tested with hydrostatic pressure 50 per cent in excess of the maximum working pressure, as required in Paragraph 1621.

Plunger shoes, by-passes, and piston rods of hydraulic elevators shall be exposed, thoroughly cleaned, and inspected when the pressure and discharge tanks are cleaned and inspected.

The water in the pressure tank of a hydraulic elevator shall be maintained at about two-thirds of the capacity of the tank.

No hydraulic elevator shall be permitted in service which shows a movement of the car of more than 3 inches per minute when the operating lever is in the "off" position.

Elevator hoistways and pits shall be kept clean. No rubbish shall be allowed to accumulate therein, nor shall any part be used for storage.

Hatch covers shall not be used for storage or similar purposes.

No material not a permanent part of the elevator equipment shall be permitted on the top or cover of an elevator car.

All tests and preparation for tests and inspections shall be at the expense and risk of the owner.

The cars of all elevators when not in use shall be lowered to the lowest landing.

Qualifications and Duties of Operators of Elevators

Qualifications of Operators: Operators shall be not less than 18 years of age.

Operators shall be free from serious physical or mental defects and shall be selected with consideration for their ability to perform their duties in a careful and competent manner.

Training of Operators: Except during an emergency, one week's training under the direction of a competent operator shall be required before a new operator is placed in charge of any elevator.

Instructions to Operators: All elevator operators shall be instructed as follows:

> Always open the service switch of an electric elevator or lock the operating mechanism of a hydraulic, steam or belted elevator before cleaning or oiling any part of the machine or regulator or when placing the elevator out of service.
>
> Be sure the operating mechanism is in the "stop" position before closing the service switch.
>
> Make a trial inspection trip each morning before carrying passengers.
>
> Report any defects promptly to the person in charge.
>
> Do not attempt to make repairs unless competent to do so.
>
> Never operate nor attempt to operate the car from the controller in the machine room.
>
> Carry no passengers or freight while inspections, repairs, or adjustments are in progress, and operate the car only in response to directions from the inspector or person in charge. Do not move the car when any one is in the pit or on top of the car except as they may direct.
>
> See that the locking device and safe-hoisting attachments are in place before a safe or other heavy concentrated load is moved on or off the car platform.
>
> Do not allow other persons to ride in the elevator while a safe or other heavy object in excess of the contract capacity of the elevator is being carried.
>
> No hand elevator shall be used for carrying safes or other heavy objects of weight greater than the normal rated capacity of the elevator.

Hoistway doors or gates shall always be locked in the closed position before the car is started. The car shall be brought to a stop at the landing level before the hoistway door or gate is fully opened.

Keep car gates, if any, closed while running, and where no car gates are provided, keep passengers away from the open edge of the car platform.

Limit the number of passengers to the contract capacity of the car.

Do not reverse the operating device suddenly, stop before reversing.

Move operating device to the "stop" position on approaching a terminal landing without waiting for the terminal stopping devices to come into action.

If the power goes "off" while the car is in motion, move the operating device to the "stop" position and start the car in the usual manner upon return of the power.

If the car refuses to stop, do not attempt to jump off. The car will be stopped by the application of the safeties if it attains excessive speed of descent or by the automatic terminal stops at either end of the hoistway.

If the car should stop suddenly, call for the person in charge and operate the machine only at his direction.

If the car will not start, return the operating device to the "stop" position. If the car is apparently overloaded, remove part of the load and try the operating device. If the car still will not move, return operating device to the "stop" position and notify the engineer or other qualified person.

Before allowing freight to be loaded or unloaded, lock the hand rope on all rope-operated cars.

Familiarize yourself with the emergency devices, understand their function, and know how to operate them.

Never leave the car in the ordinary course of operation nor leave the operating mechanism unprotected. When going off duty for any reason, even for a few minutes, be sure that the power is disconnected or that the operating mechanism is locked and the hoistway doors are closed.

Always leave a hydraulic elevator operated by a lever at the lower landing with the lever in the position for down motion.

Wear clothing which offers no undue accident hazard to yourself or to the occupants of the car.

Learn these rules thoroughly.

Responsibilities of Operators: All operators of elevators shall strictly comply with the aforegoing instructions. In addition, operators shall report to their employers any violations of instructions, or defects in the elevators, that may come under their notice.

Violations of Instructions: In addition to the penalties prescribed in Paragraph 1922 for violations of the provisions of Chapter 91 of this Code, any elevator operator who is unqualified or who violates the instructions for the operation of elevators shall be immediately relieved of his duty of operating the elevator and the elevator shall be sealed until such time as a qualified and acceptable operator shall be placed in charge.

Penalties for Violation of Elevator Regulations

Par. 9109. For penalties for violations of Chapter 91 of this Code, refer to Paragraph 1922 of this Code.

SECTION 911

HOISTWAY CONSTRUCTION AND HOISTWAY GUARDS

Hoistway Enclosures and Guards

Par. 9110. Where enclosures as regulated in Parts IV and V are not required, hoistways shall be enclosed to a height of not less than 6 feet above each floor on all sides not used for loading or unloading, except as follows:

Where material is stored near a hoistway, the hoistway shall be enclosed from floor to ceiling.

For power elevators, except sidewalk elevators having a travel not exceeding 30 feet and elevators having car doors or gates equipped with electric contacts, the hoistway shall be enclosed from the door lintel to the ceiling, on the side or sides used for loading or unloading.

Where an elevator is located within 3 feet of a stairway, that portion of the hoistway facing the stairway shall be enclosed from the floor to a height of not less than 6 feet above each stair tread which is within 3 feet of the hoistway.

For dumbwaiters serving more than two floors, the hoistway shall be enclosed from floor to ceiling.

For dumbwaiters whose cars have an area of 3 square feet or less, the hoistway need not be enclosed.

Such enclosures shall be building walls or partitions, lattice or grille work, metal gratings or expanded metal with smooth edges, the openings in all of which shall not pass a ball larger than one and one-half inches in diameter. The diameter of the wire in grille work shall be not less than No. 13 Steel Wire

Gauge or 0.0915 inch and the thickness of expanded metal shall be not less than No. 13 U. S. Gauge or 0.094 inch.

When either of the following conditions exist, openings in the enclosures shall be covered with a netting of square mesh not greater than one-half inch and of wire not smaller than No. 20 Steel Wire Gauge or 0.0348 inch diameter:

The clearance between the enclosure and any part of the car, counterweight or any sliding landing door is less than one inch.

The enclosure is grille or openwork having openings which will pass a one-half inch diameter ball, and the openings in the enclosure are less than six feet above any landing, stairway, floor or platform.

The hoistway enclosure adjacent to a landing opening shall be of sufficient strength to support in true alignment the hoistway doors and gates with their operating mechanism and interlocks.

Projections, except interlocks, indicators and signal devices, extending inward from the general surface of any hoistway enclosure, and which are opposite the car entrance of a power elevator, shall be beveled on the under side or shall be guarded with metal plates not less than one-sixteenth inch thick. The angle of such bevels or plates shall be not less than 60 degrees from the horizontal. The metal plates shall be smooth and firmly and permanently fastened to the hoistway enclosure.

Recesses, other than for windows and landing openings, in any hoistway enclosure which are opposite the car entrance of power elevators shall be filled flush with the general inner surface of the enclosure.

Windows in any hoistway enclosure which are opposite the car entrance of power freight elevators shall be provided on the inside with vertical bars or gratings having the required clearance from the car, except where the car is equipped with a door or gate having electric contacts. The soffit of such window openings shall be beveled as required above for projections, the base of the bevel extending to at least the window-face of the bars or to the grating.

Counterweight runways for power elevators located in the elevator hoistway shall each be enclosed from a point 12 inches above the floor of the pit to a point at least 7 feet above the floor of its own pit and any other pit adjacent to such counterweight runway, except where compensating chains or cables, which practically compensate for the weight of the cables, are attached to the counterweight, in which case counterweight-runway enclosures shall not be required on the side facing the elevator.

Runways for counterweights located outside of the elevator hoistway shall be enclosed throughout their height, except that when the runway is located outside of the building, it shall be enclosed to a height of at least 7 feet from the ground.

Access shall be provided for inspection, maintenance and repair of all counterweights and cables. All doors to counterweight-runway enclosures shall be self-closing. Where the counterweight is located in the same hoistway as the car and can be inspected at mid-travel from the car, hinged sections are not required in the counterweight-runway enclosure.

Hoistway Doors and Hatch Covers

Par. 9111. Landing openings in hoistway enclosures shall be provided with doors or gates which, except as otherwise permitted, shall guard the full height and width of the opening. For additional requirements for doors protecting landing openings in required fire-resistant enclosures, refer to Part V.

Landing openings in hoistway enclosures shall be protected by sliding doors, combination sliding and swinging doors, or by swinging doors, except that vertically sliding gates may be used to protect landing openings in enclosures not required to be fire-resistive of freight elevator and dumbwaiter hoistways.

If vertically sliding or counterbalanced doors are used, the car gate or door and the hoistway doors shall be so interlocked that the car gate or door cannot open more than 24 inches until the hoistway door is locked in its fully opened position and so that the landing door cannot start to close until the car gate or door is closed to within 24 inches of full closure, except doors used exclusively for freight.

The landing door or gate for enclosures not required to be fire-resistive of freight elevator hoistways shall extend from the landing threshold to a height of at least 66 inches when closed.

Hoistway gates, for freight elevators, made of grille, lattice or openwork shall not pass a ball larger than 2 inches in diameter. Collapsible gates are not permitted.

Full-automatic gates will be permitted only at terminal landings for freight elevators operating at a speed not in excess of 75 feet per minute, and at all landings of freight elevators having a speed not in excess of 75 feet per minute used primarily for carrying automobiles.

Full-automatic doors or gates shall not be closed by the direct mechanical action of the car, but their speed in closing may, however, be retarded by the car.

Semi-automatic gates or doors of power freight elevators shall be provided with a locking device which will prevent the normal opening of the gate or door unless the car floor is at or near the landing.

Semi-and full-automatic gates shall move in guides.

An automatic fire door, the functioning of which is dependent on the action of heat, shall not lock any landing opening in the hoistway enclosure of any passenger elevator.

Hoistway doors for all power passenger elevators shall be provided with interlocks. In addition, the hoistway doors for hydraulic passenger elevators shall be provided with a door closer or a device which will compensate for the creeping of the car away from the landing.

The hoistway doors and gates for freight elevators shall be provided with locking devices as follows:

Interlocks, or electric contacts and mechanical locks, conforming to the requirements of Paragraphs 9112 and 9113, respectively, shall be provided for all power elevators.

Mechanical locks shall be provided for all hand and gravity elevators and for all power elevators using semi- or full-automatic doors or gates.

The hoistway doors and gates for automatic-operation and continuous-pressure-operation elevators shall be provided with interlocks or with electric contacts and mechanical locks, conforming to the requirements of Paragraphs 9112 and 9113, respectively, under the following conditions:

For contract speeds not in excess of 150 feet per minute, mechanical locks and contacts may be used if vertically sliding landing gates or bi-parting vertically sliding landing doors are used.

For contract speeds above 150 feet per minute, interlocks shall be used.

If horizontally sliding or swinging, or combination sliding and swinging landing doors are used, interlocks shall be provided irrespective of the contract speed.

If electric contacts are provided on a hoistway door or hoistway gate, and are not a part of an interlock system, the lock or latch and contact shall be so arranged as to insure the door or gate being in a position to be locked or latched when or before the contact is closed.

Door and gate electric contacts and door locks or latches shall be so located as normally to be inaccessible from the landing side.

Hoistway doors or gates for freight elevators shall withstand a force of 75 pounds applied perpendicularly to the plane of the door or gate at any point without permanent deformation and without being sprung from the guides.

The distance between the hoistway side of the hoistway door opposite the car opening and the hoistway edge of the landing sill shall be not more than 4 inches, except that for automatic-operation elevators such distance shall be not more than one-half inch for swinging doors nor more than two and one-quarter inches for sliding doors. In no case shall the hoistway door project into the hoistway beyond the edge of the landing sill.

Hardware for doors, except that required for inter-locking, indicator or signal devices, shall not project into the hoistway beyond the line of the landing threshold.

Hoistway doors shall be arranged to be opened by hand from the hoistway side, except when locked out of service. Neither the main exit door nor the door at the lower terminal landing shall be locked out of service while the elevator is in operation.

If the entire control of a power elevator is located on the car, or if the control is not located entirely on the car and the car is not within the landing zone, the doors shall be so arranged that they cannot be opened from the landing side except with a service or an emergency key.

A service key shall be provided to open the hoistway door from the landing side at the landing where the car is normally parked out of service, except for automatic-operation and continuous-pressure operation elevators. This key shall open this door only when the car is within the landing zone and shall open no other hoistway door.

An emergency key shall be provided which will open, from the landing side and irrespective of the position of the car, the hoistway door at the landing where the car is normally parked, the lowest landing, and such other hoistway doors and emergency doors as are specified hereafter. It shall open no other hoistway door. Such an emergency key shall be placed in a break-glass receptacle clearly marked: "Elevator door Key—For Fire Department and Emergency Use Only", and located at the landing nearest the main entrance to the building.

For an elevator operating in a blind hoistway, the first hoistway door above the blind portion of the hoistway shall be so arranged that it can be opened from the landing side by the emergency key specified above, irrespective of the position of the elevator car. If an elevator is installed in a single hoistway, the emergency key shall open all hoistway doors and where the elevator is installed in a single blind hoistway, emergency hoistway doors shall be provided at every third floor, but not more than 40 feet apart, to permit access to the elevator in the blind portion of the hoistway. Such emergency hoistway doors shall have a clear opening not less than 30 inches wide and 6 feet 6 inches high, and shall be easily accessible and free from fixed obstructions. Such doors shall be self-closing and self-locking and shall not be openable from the hoistway side, unless provided with interlocks. The emergency key required above shall open all such emergency hoistway doors.

Hangers for power-operated hoistway doors shall be designed to withstand a downward thrust of five times the weight of the door and an upward thrust of four times the weight of the door.

Means shall be provided to prevent hangers for all sliding hoistway doors from jumping the tracks. Stops shall also be provided to prevent the hanger carriage from leaving the ends of the track, or suitable stops may be provided on the door only.

Manually operated or self-closing landing doors of the vertically or horizontally sliding type for automatic- and continuous-pressure-operation elevators shall be provided with a vision panel or panels, except at landings where a signal device is provided to indicate the arrival of the car. All swing type hoistway doors shall be provided with a vision panel or panels. Vision panels may be provided for any type of hoistway door irrespective of the type of operation of the elevator. Where required or used, vision panels shall conform to the following requirements:

> The area of any single panel shall be not less than 25 square inches and the total area of the panel or panels shall be not more than 80 square inches.
>
> Each clear panel opening shall reject a 6 inch diameter ball.
>
> Where mullions or division strips are used between panels, they shall be of fire-resisting material and of substantial construction and design.
>
> Panels shall be made of clear wired plate glass.
>
> The center of the panels shall be not less than 60 inches above the elevator landing.

Gate or door counterweights shall run in metal guides from which they cannot become dislodged, or shall be boxed in. The bottoms of the guides or boxes shall be so constructed as to retain the counterweight if the counterweight rope breaks.

Hatch covers of sidewalk elevators shall be of metal of the hinged or vertically lifting type and shall be designed to support the live load specified in Paragraph 6031 for the area in which they are placed. The dimensions of sidewalk hatch openings shall meet the requirements of Section 213. No hatch cover of the hinged type for sidewalk elevator shall be arranged so as to open against any building. Hatch covers of sidewalk elevators shall be self-closing and the fastening or holding open of the cover when the car is away from the top landing shall be forbidden, except only when necessary to get material in or out which cannot be placed in the elevator, and then only by special permission from the Buildings Engineer.

The upper terminal landing opening of under-counter dumbwaiters shall be provided with means to guard persons from falling down the hoistway.

Hoistway doors of power dumbwaiters serving terminal landings only may remain open if equipped with a system of operation which permits the car to be sent from but not called to the landing, and if the bottom of the hoistway door, except the hoistway door at the lower end of the hoistway, is not less than 18 inches above the floor.

Landing openings for automatic-operation dumbwaiters serving more than two landing levels, and power dumbwaiters serving terminal landings only and equipped with a system of operation which permits the car to be called from a landing, shall be protected with doors or gates equipped with electric contacts which will prevent the operation of the machine while any hoistway door or gate is open.

If the bottom of the opening in a dumbwaiter hoistway is less than 30 inches above the floor and the door opening is large enough to be mistaken for a door opening to a room, the hoistway door shall be in two parts, one above the other, the lower part extending not less than 30 inches above the floor and arranged to be opened only after the upper part has been opened and to close when the upper part closes, except where gates which close when the car leaves the landing are installed in addition to the landing doors.

Hoistway Door Interlocks

Par. 9112. A "Door Unit Interlock System" shall be used only where there is a regular operator in the car and where the elevator can be operated only from the inside of the car.

For power elevators employing a type of operation that does not require the presence of an operator in the car or where the hoistway door is not equipped with a door closer, the hoistway door shall be considered to be in the closed position only when the door is within $\frac{3}{8}$ inch of the nearest face of the door jamb containing the lock, or, in the case of bi-parting doors, when the doors are within $\frac{3}{8}$ inch of contact with each other.

Where the hoistway door of an elevator requiring the presence of an operator in the car is equipped with a door closer, the door shall be considered to be in the closed position when the door is within 4 inches of the nearest face of the door jamb containing the lock or in the case of bi-parting doors when the sections are within 4 inches of contact with each other, if at this position, and any other up to the closed position as previously defined where the hoistway door is not equipped with a door closer, the door cannot be opened from the landing side more than 4 inches from the jamb or 4 inches between sections in the case of bi-parting doors, and if the door closer is of a type which will eventually close the door to the fully closed position and lock it in that position.

A device employing locks and contacts of a type where the contact is made when the door is closed and the locking of the door takes place subsequently are not considered interlocks and are not permitted to be used.

Interlock contacts shall be positively opened, and the functioning of the interlock to prevent movement of the car shall not be solely dependent on the action of a spring, gravity, nor upon the closing of an electric circuit.

Each type and make of interlock shall satisfactorily pass the following tests before being approved by the Buildings Engineer:

A. Endurance Test.
B. Current-Interruption Test.
C. Test in Moist Atmosphere.
D. Test Without Lubricant.
E. Misalignment Test.
F. Insulation Test.
G. Force and Movement Test.

These tests shall be made according to the procedure and specification in Paragraph 9104.

Minor changes in design may be made without retesting, subject to the approval of the Buildings Engineer.

Approved interlocks shall be plainly marked for identification. The markings shall be permanent and so placed as to be readily visible when the interlock is mounted in position. The identification mark shall include the manufacturer's name or trade mark, the type or style letter or number, and the rated voltage.

Hoistway Door Electric Contacts

Par. 9113. A "Door Unit Electric Contact System" shall be used only on elevators where there is a regular operator in the car and where the elevator can be operated only from the inside of the car.

Where the hoistway-door or hoistway-gate contacts are not a part of an interlock system, the door or gate shall be considered to be in the closed position when it is within two inches of the nearest face of the jamb containing the lock, or, in the case of bi-parting doors, when the doors are within two inches of contact with each other.

Hoistway-door and hoistway-gate contacts shall be designed so that they are positively opened by a lever or other device attached to and operated by the door or gate.

The functioning of a hoistway-door or hoistway-gate electric contact to prevent the movement of the car shall not be solely dependent on the action of a spring, gravity, nor upon the closing of an electric circuit. If springs are used, they shall be in compression.

Each type and make of hoistway door or gate electric contact which is not part of an interlock shall satisfactorily pass the following tests before being approved by the Buildings Engineer:

A. Endurance Test.
B. Current-Interruption Test.
C. Test in Moist Atmosphere.
E. Misalignment Test.
F. Insulation Test.

These tests shall be made according to the procedure and specifications in Paragraph 9104.

Minor changes in design may be made without retesting, subject to the approval of the Buildings Engineer.

Approved contacts shall be plainly marked for identification. The markings shall be so placed as to be readily visible when the contact is mounted in position. The identification mark shall include the manufacturer's name or trade mark, the type or style letter or number, and the rated voltage.

Penthouses and Machine Rooms

Par. 9114. Where the machine room or overhead machinery space is more than 5 feet above the adjacent floor or roof surface, access to the entrance shall be provided by means of an incombustible stair having an angle not exceeding 60 degrees from the horizontal. When the difference is 5 feet or less, a vertical ladder may be used.

The stair shall be fitted with a metal handrail above the outside stringers. When the entrance door opens outward a platform shall be provided not more than 8 inches below the door sill. The platform shall be not less than 2 feet wide and shall project not less than 2 feet beyond the jamb of the door containing the lock. A guard rail shall be provided at the edge of the platform except where the ladder or stair joins the platform.

Elevator penthouses shall not be used as public thoroughfares. Doors to elevator penhouses shall be fitted with locks which permit the doors to be opened from the inside without keys.

In the space provided for elevator machinery, the headroom above the floor or platform which is required by Paragraph 9116 shall be not less than the following:

> For elevator hoisting machines—6 feet.
>
> For secondary sheave spaces containing machinery, pertaining to the elevator only, in addition to sheaves—4 feet 6 inches.
>
> For secondary sheave spaces containing no machinery in addition to the sheaves or for spaces containing other sheaves vertically over the car—3 feet 6 inches.

Machine and supporting beams may encroach on this headroom in the secondary sheave space provided there is a clearance of not less than 2 feet 6 inches between the underside of such beams and the top of slab or grating at the secondary-sheave level.

Power elevator machines shall be surrounded by grille work or other enclosures unless secured against unauthorized access, or unless located in a machine, engine or pump room in charge of an attendant.

Exposed gears, sprockets, tape and rope sheaves, also belts, ropes and tapes passing through secondary levels shall be guarded in accordance with Chapter 92.

Elevator Machine Supports

Par. 9115. All elevator machinery and sheaves shall be so supported and held as to effectually prevent any part from becoming loose or displaced. The supporting beams shall be of steel or reinforced concrete, except that they may be of wood where fire-resistive hoistway enclosures are not required.

Loads on overhead beams and their supports shall be computed as follows:

> The total load on overhead beams shall be assumed as equal to the weight of all apparatus resting on the beams plus twice the maximum load suspended from the beams.

The load resting on the beams shall include the complete weights of machines, sheaves, controllers, and similar equipment. The load suspended from the beams shall include the sum of the tensions of all cables suspended from the beams.

Elevator machinery shall not be hung underneath the supporting beams at the top of the hoistway, except idler or deflecting sheaves, devices and their accessories for limiting or retarding the car speed, dumbwaiter machines and overhead sheaves for personal service elevators.

Supporting members for sheaves and other elevator machinery hung underneath beams shall not depend solely on cast iron in tension.

The factor of safety for all overhead beams and their supports, based on the static loads shall be not less than the following:

For steel 5
For reinforced concrete........... 7

The allowable deflections of overhead beams and their supports shall be in accordance with the following:

For overhead machine beams of all alternating current installations, and for direct current installations where the car speed is over 150 feet per minute, the deflection under static load shall not exceed 1/2000 of the span.

For overhead machine beams of direct current installations, where the car speed is 150 feet per minute or less, the deflection under static load shall not exceed 1/1666 of the span.

For all overhead sheave beams the deflection under static load shall not exceed 1/1333 of the span.

For overhead beams supporting machine beams, the deflection under static load shall not exceed 1/1666 of the span.

Platforms Under Machinery

Par. 9116. A floor of iron, steel or reinforced concrete, capable of sustaining one concentrated load of 300 pounds placed on any part thereof, shall be provided at the top of each hoistway for passenger and freight elevators, either immediately below the sheaves or drum or at the level of the top of the machine beams.

If the flooor consists of metal-bar grating, the openings between the bars shall not pass a ball larger than three-quarter inch in diameter, and if of perforated sheet metal, the perforation shall not pass a ball larger than one inch in diameter.

The floor shall cover the entire hoistway if the cross-sectional area is 50 square feet or less, otherwise it shall extend not less than 2 feet beyond the general contour of the sheaves or machines, and to all entrances to the hoistway which are at or above the level of the floor.

If the floor does not entirely cover the hoistway the open or exposed sides shall be provided with either a standard metal handrail and toeboard meeting the requirements of Paragraph 9298, or with a screened railing not less than 42 inches high.

Where no floor complying with the foregoing requirements is provided over the entire area of the hoistway below the deflecting or secondary sheaves extending below the machine level, there shall be provided below such sheaves, an auxiliary platform or cradle of the same design and construction as required for the machine floor.

Landings for Elevators

Par. 9117. The landing thresholds for elevators shall be constructed and maintained so that persons will not readily slip or trip thereon.

If there is a railroad track upon any elevator landing, the tops of the rails shall be flush with the floor for a distance of 6 feet from the threshold.

Pipes and Wiring in Hoistways

Par. 9118. Pipes conveying steam, gases or liquids, which, if discharged into the hoistway, would endanger life, shall not be installed in, over, or under any elevator or counterweight hoistway.

Electrical conduits or cables installed in any elevator or counterweight hoistway shall meet the requirements of Section 847.

Thoroughfares Over or Under Hoistways

Par. 9119. A hatch cover of the vertical lifting type for a sidewalk elevator shall not be used as a thoroughfare unless there is a clear space of at least 2 feet above the hatch cover when it is at the top of its travel and unless gates, not less than 30 inches high, are placed at the exposed sides before the hatch cover is raised. No hinged type hatch cover shall be used as a thoroughfare unless, when opened, there is a space of not less than 18 inches between the covers and any obstruction in the direction of the opening.

There shall be no thoroughfare under the hoistway of any elevator or counterweight unless all of the following contions exist:

> Bumpers or buffers are provided conforming to the requirements of Paragraphs 9123, 9133 and 9143.
>
> The car and counterweights are provided with safety devices conforming to the requirements of Paragraphs 9125 and 9135.
>
> A structure is placed under the hoistway designed to withstand, without failure, the impact of the car or counterweight descending with contract load at contract speed or at governor tripping speed where a governor is used.

SECTION 912

ELECTRIC PASSENGER ELEVATORS

General Requirements for Electric Passenger Elevators

Par. 9120. The contract speed of electric passenger elevators shall not exceed the following:

a. For automatic-operation elevators and elevators controlled by a regular operator, 1500 feet per minute.

b. For elevators with continuous-pressure operation, 150 feet per minute.

c. For other elevators, 100 feet per minute.

Clearances for Electric Passenger Elevators

Par. 9121. There shall be a clearance of not less than three-quarters inch between the sides of the car of an electric passenger elevator and the hoistway enclosure and of not less than one inch between the car and its counterweights.

The clearance between the car platform and the landing sills shall be not less than one-half inch where side-post construction is used for the guide rails and three-quarters inch where corner-post construction is used. The clearance in each case shall not exceed one and one-half inches.

The clearance between the hoistway enclosure and a loading side of the car platform shall be not more than 5 inches, except where the doors are installed wholly within the hoistway, in which case the clearance shall not exceed 7½ inches, and except where the cars have doors or gates equipped with electric contacts.

If two or more cars operate in adjacent hoistways, the clearance between cars shall be not less than two inches.

A pit shall be provided at the bottom of every electric passenger elevator hoistway. Pits deeper than 4 feet shall be provided with permanent means of access. The floor of the pits shall be approximately level, except that this requirement may be waived if old foundation footings are encountered in a new installation and it is inadvisable to remove the footings, but the maximum permissible encroachment shall be 15 per cent of the cubic content of the pit. There shall be no trenches or depressions in elevator pits, except by special permission from the Buildings Engineer and then only where practical difficulties make such trenches and depression necessary.

A wire screen partition not less than 12 inches high shall be placed between adjacent pits of different depths.

When the car of an electric passenger elevator rests on the fully compressed buffer there shall be a vertical clearance of at least two feet between the lowest projection on the underside of the car platform, except guide shoes and aprons attached to the sill, and the floor of the pit or any obstruction in the pit, exclusive of the compensating device, buffer and buffer supports, and foundation encroachments. The depth of any trench or depression shall not be considered in determining this clearance.

The pit depth, the top clearance of the car and the top clearance of the counterweight for elevators having a contract speed of 200 feet per minute or less shall be not less than the values given in the following table:

TABLE 9121T

Contract speed in feet per minute	Pit Depth in feet	Top Clearance of car in feet	Top Clearance of Counterweight in feet
Up to 100	4.5	4.0	3.0
101 to 200	5.5	4.5	3.5

The values given in Table 9121T may be reduced subject to the approval of the Buildings Engineer, where practical difficulties make it essential, if, when the car is resting on the fully compressed buffer, the minimum vertical distance, herein required, between the underside of the car platform and any obstruction in the pit is maintained and the top clearance of the counterweight is not reduced below one foot and if, when the counterweight is resting on the fully compressed buffer, the top clearance of the car is not reduced below two feet.

The pit depth for an elevator having a contract speed in excess of 200 feet per minute shall be equal to at least the sum of the three following items, except as otherwise permitted below when precompressed car buffers are used:

1. The overall length of the fully extended buffer used.

2. The distance between the upper surface of the car platform and the under surface of the buffer striker plate.

3. Three inches.

Where practical difficulties make it essential, the pit depth required above may be reduced, subject to the approval of the Buildings Engineer, by precompressing the car buffer. In such cases, the pit depth shall be equal to at least the sum of the following two items:

1. The overall length of the fully extended buffer used, less the amount of precompression.

2. The distance between the upper surface of the car platform and the under surface of the buffer striker plate.

Where trenches or depressions are permitted by the Buildings Engineer for the installation of buffers and compensating sheaves, the depth of such trenches or depressions shall be included in the pit depth.

The top clearance of the car, for contract speeds in excess of 200 feet per minute, shall be equal to at least the sum of the following four items, except as otherwise permitted below when precompressed counterweight buffers are used:

1. The clearance between the counterweight buffer and its striking block, which shall be at least 6 inches.

2. The stroke of the counterweight buffer used.

3. Two feet.

4. The counterweight buffer stroke corresponding to the governor tripping speed of the car, as determined by Paragraph 9123, less one-half of the stroke of the counterweight buffer used. This item may be omitted if provision is made to eliminate the jump of the car at counterweight-buffer engagement.

Where practical difficulties make it essential, the top clearance of the car required above may be reduced, subject to the approval of the Buildings Engineer, by precompressing the counterweight buffer, provided a spring-return type of buffer is used. In such cases, the top clearance of the car shall be equal to at least the sum of the three following items:

1. The stroke of the counterweight buffer used, less the amount of precompression.

2. Two feet.

3. The stroke of the counterweight buffer corresponding to the governor tripping speed of the car, as determined by Paragraph 9123, less one-half of the stroke of the counter-

weight buffer used. This item may be omitted if provision is made to eliminate the jump of the car at counterweight-buffer engagement.

The top clearance of the counterweight, for contract speeds in excess of 200 feet per minute, shall be equal to at least the sum of the following four items, except as otherwise permitted below when precompressed buffers are used:

1. The clearance between the top of the car buffer and its striker block, which shall be at least 3 inches.

2. The stroke of the car buffer used.

3. Six inches.

4. The stroke of the car buffer corresponding to the governor tripping speed of the car, as determined by Paragraph 9123, less one-half of the stroke of the car buffer used. This item may be omitted if provision is made to eliminate the jump of the counterweight at car-buffer engagement.

Where the pit depth has been reduced by precompressing the car buffer, the top clearance of the counterweight required above shall be equal to at least the sum of the following three items:

1. The stroke of the car buffer used, less the amount of precompression.

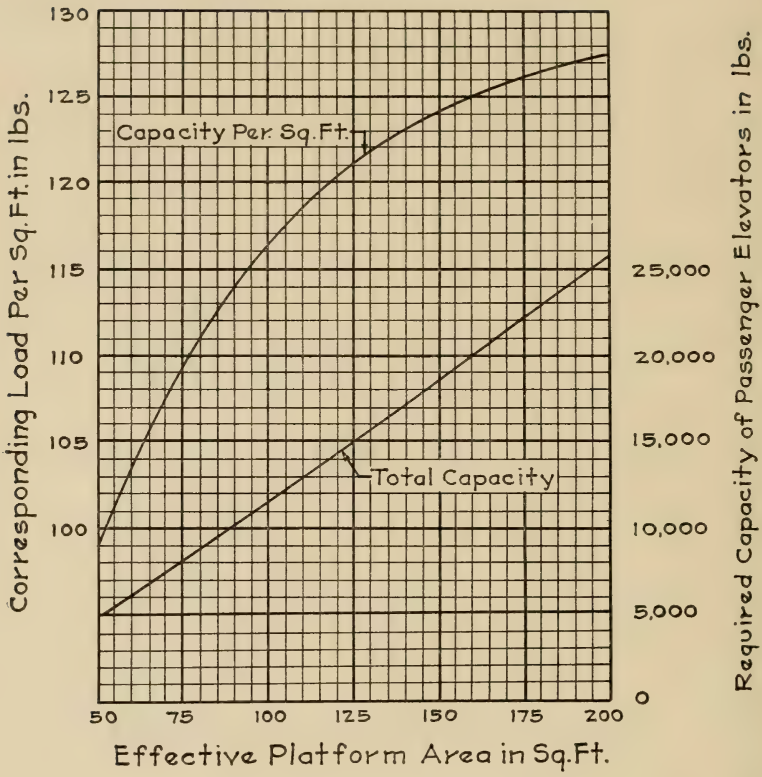
2. Six inches.

3. The stroke of the car buffer corresponding to the governor tripping speed of the car, as determined by Paragraph 9123, less one-half of the car buffer stroke used. This item may be omitted if provision is made to eliminate the counterweight jump at car-buffer engagement.

Capacity and Loading for Electric Passenger Elevators

Par. 9122. The contract load of an electric passenger elevator in pounds corresponding to the effective platform area of the car, shall be not less than the amount given in Diagrams 9122 D1, and 9122 D2.

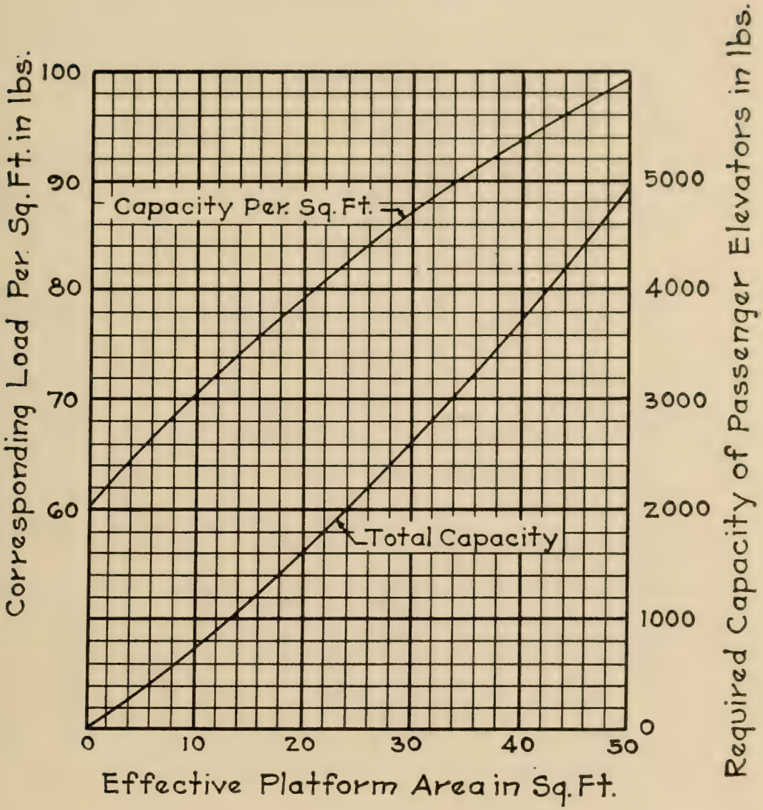
DIAGRAM 9122D1



$$\text{Capacity Per. Sq. Ft.} = 60 + 70\left(1 - \frac{1}{e^{.0166X}}\right)$$

X = Effective Platform Area in Sq. Ft.

DIAGRAM 9122D2



$$\text{Capacity Per. Sq. Ft.} = 60 + 70\left(1 - \frac{1}{e^{.0166X}}\right)$$

X = Effective Platform Area in Sq. Ft.

For passenger elevators having effective platform areas of more than 200 square feet, the contract load shall be not less than 128 pounds per square foot.

A metal plate showing the contract load of the elevator in pounds in letters or figures not less than one-quarter inch high and stamped, etched or raised on the surface of the plate, shall be fastened in a conspicuous place in the elevator car.

A metal plate bearing the following information shall be placed upon the crosshead:

> The weight of the complete car, including the safeties.
>
> The contract car speed in feet per minute at which the elevator is designed to travel.
>
> The cable data as required by Paragraph 9127.

Electric passenger elevators shall not be used for carrying safes or other one-piece loads greater than the contract load of the elevator unless the following requirements are complied with:

> A locking device shall be provided which will hold the car at any landing independently of the hoisting cables while the safe or other object is being loaded or unloaded.
>
> The locking device shall be so designed that it cannot be unlocked unless the entire weight of the car and load is suspended on the cables.
>
> The wrench or other device for operating the locking device shall be removable.
>
> The locking device shall be designed to withdraw the bars should it come in contact with the landing locks if the car is operated on the up-motion.
>
> A metal plate shall be provided in the elevator car which shall bear the words "Capacity Lifting Safes" in letters followed by figures giving the capacity in pounds for lifting safes for which the machine is designed, the letters and figures to be not less than one-fourth inch high, stamped, etched or raised on the surface of the plate.
>
> The car platform, car frame, sheaves, shafts, cables, and locking device shall be designed for the specified "Capacity Lifting Safes" with a factor of safety of 5.
>
> The car safeties shall be designed to stop and hold the specified "Capacity Lifting Safes" with the cables intact.
>
> Where there is a passageway under the hoistway, the machine shall be designed to operate with the "Capacity Lifting Safes" at slow speed and the car safety shall be designed to stop and hold the car and "Capacity Lifting Safes" independently of the cables.

For traction machines additional counterweight shall be added so that the total overbalance is at least equal to 45 per cent of the "Capacity Lifting Safes".

The locking device shall be provided for any passenger elevator installed for carrying safes or other one-piece loads which exceed 75 per cent of the contract load.

The "Capacity Lifting Safes" of any traction elevator shall not exceed one and one-third times the contract load of the elevator.

All elevator machines equipped for carrying safes or other one-piece loads greater than the contract load of the elevator shall be provided with a special switch near the machine for operating under such conditions.

Counterweights, Guides and Buffers for Electric Passenger Elevators

Par. 9123. The counterweights of electric passenger elevators shall run in guides and shall be guided at the top and bottom. The guiding members shall have sufficient strength to withstand the reactions resulting from the normal operation of the counterweight and from the operation of the counterweight safety where provided.

If two counterweights run in the same guides, the car counterweight shall be above the machine counterweight and there shall be a clearance of not less than 8 inches between the counterweights. The cables of the machine counterweight shall be covered or protected by metal or fiber sleeves firmly attached to the cable. These sleeves shall be not less than 6 inches longer than the car counterweight. The ends of metal sleeves shall be carefully reamed before being placed on the cables.

If an independent car counterweight is used, it shall not be of such a weight to cause undue slackening in any of the cables during acceleration or retardation of the car.

Counterweight sections, whether carried in frames or not, shall be secured by at least two tie rods passing through holes in all the sections. The tie rods shall have lock nuts at each end. The lock nuts shall be secured by cotter pins.

Where winding drum machines are used, a permanent beam or bar shall be provided at the top of the counterweight guides and beneath the counterweight sheaves to prevent the counterweight from being drawn into the sheaves. It shall be of such strength that the cables will be pulled out of the sockets before there is failure of the beam. The bar or beam shall be located in line with the center of mass of the counterweight or, if more than one stop is used, they shall be located symmetrically with respect to the counterweights.

The car and counterweight guide rails of electric passenger elevators shall be of steel and of such size that they will withstand the application of the safeties when stopping the fully loaded car or the counterweight. Where only one safety device gripping both rails in a horizontal plane is used, the weight of each guide rail shall be not less than that shown in Table 9123 T1. Where two such safety devices are used on the same guide rail and arranged so that both will be applied at practically the same time and with substantially equal retarding force, the total weight of the car and load or of the counterweight may exceed that shown in Table 9123T1, but shall not in any case be greater than such tabulated values multiplied by the factors given in Table 9123T2.

TABLE 9123T1

Maximum Permissible Total Weight of Car and Load: Total Weight of Counterweights In Pounds per Pair of Rails	Minimum Weight of Each Car Guide Rail in pounds per foot	Minimum Weight of Each Counterweight Guide Rail in pounds per foot.		
		With Guide-Rail Safeties	Without Guide-Rail Safeties	
			1-to-1 Roping	2-to-1 Roping
4,000	7½	* 7½	6½	6½
15,000	14	14	7½	7½
27,500	22½	22½	7½	14
40,000	30	30	7½	14

* If the rails are effectively bracketed or tied at intervals of 6 feet or less to prevent spreading the weight of the counterweight may be doubled.

TABLE 9123T2

Distance between Safeties in Feet	Factor
Car Duplex Safeties	
18 (or over)	2.0
15	1.83
12	1.67
9	1.50
6	1.33
Counterweight Duplex Safeties	
15 (or over)	2.0
10	1.67
5	1.33

Guide rails shall be securely fastened to iron or steel brackets, or their equivalent, of such strength, design, and spacing that the guide rails and their fastenings shall not deflect more than one-fourth inch under normal operations.

Where the distance between rail supports is greater than 14 feet, the rail shall be suitable backed or bracketed to secure sufficient rigidity for satisfactory operation.

Joints of steel guide rails shall be:

Accurately machined with tongue and groove through the webs and with the backs of the flanges where the fishplates bear accurately machined at right angles to the tongue and groove and fitted with finished fishplates, each secured with not less than 4 substantial bolts through each rail; or

Accurately machined with tongue and groove through the webs at right angles to the base and through the flanges parallel to the base and fitted with fishplates, each secured with not less than 4 substantial bolts through each rail.

Guide rails and their fastenings shall be secured in position by clips or through bolts of not less than the sizes given in Table 9123T3.

TABLE 9123T3

Weight of Rails in Pounds per Foot	Diameter of Bolts in Inches
6½—7½	½
14	⅝
22½	¾
30	¾

The guide rails shall be extended at the top and bottom to prevent guide shoes running off in case the overtravel is exceeded.

Buffers of the spring, oil, or equivalent type shall be installed under the cars of electric passenger elevators.

Spring buffers or their equivalent shall not be installed with elevators having a contract speed in excess of 200 feet per minute.

Oil buffers or their equivalent shall be installed with elevators having a contract speed in excess of 200 feet per minute. The minimum total stroke of oil buffers shall be based on an average retardation of 32.2 feet per second per second, based on the governor tripping speed, and the maximum retardation, based on the governor tripping speed, shall be not in excess of 80.5 feet per second per second.

The required buffer stroke may be reduced subject to the approval of the Buildings Engineer provided speed-retarding devices are installed for retarding the car or counterweight to a definite reduced speed before the buffer is engaged. In such case the required buffer stroke shall not be less than the distance corresponding to a retardation of 32.2 feet per second per second from 120 per cent of such reduced speed rather than from governor tripping speed, provided that for contract speeds in excess of 500 feet per minute the buffer stroke shall be not less than 18 inches.

Speed-retarding devices, installed in connection with reduced-stroke buffers shall:

Be independent of the normal and final stop switches.

Provide a retardation of the ascending car not in excess of 32.2 feet per second per second.

Provide a stopping distance for the descending car of not less than that shown by Curve I or II, in Diagrams 9129D1, 9129D2, and 9129D3.

Oil buffers shall be provided with means for gauging the amount of oil in them.

Buffers shall be located symmetrically with reference to the center of the car and arranged so that under ordinary operating conditions the car will not strike them except as hereafter provided.

Counterweight buffers, similar to those required for cars shall be installed symmetrically under the counterweights of electric passenger elevators.

Each type and size of oil buffer shall satisfactorily pass the following tests before being approved by the Buildings Engineer:

1. Retardation Test.
2. Oil Leakage Test.
3. Churning Test.
4. Plunger-Return Test.
5. Test for Lateral Movement of Plunger.

These tests shall be made according to the procedure and specifications in Paragraph 9104.

Approved buffers shall be marked by the manufacturer with the range of speed and load for which they have been approved.

Where a manufacturer's type includes buffers of the same general design, but having different strokes, if the longest-stroke buffer of a given porting has been tested and approved, the buffers of shorter strokes having the same load range may be approved by the Buildings Engineer without tests if he is satisfied that the portings provided in the shorter-stroke buffers will give the same values of retardation as the buffer tested.

Buffers shall be field tested after installation by running on to them with the contract load at not less than one-half the contract speed with final limit switches operative, except as follows: if the buffer stroke has been reduced because of the use of a speed-retarding device, the car or counterweight shall be run on the buffer at not less than one-half the speed corresponding to the buffer stroke used.

Car or counterweight buffers of the spring-return type shall be provided with a switch, operated by the buffer, in case it is compressed more than 3 inches, and so connected in the control circuit that the speed of the descending car or counterweight shall not exceed one-half the contract speed unless the buffer plunger, when released, returns to within 3 inches of its normal position.

If spring-return buffers are precompressed, they shall be so installed that when the car is level with a terminal landing, the remaining buffer stroke shall be not less than 50 per cent of the gravity stopping distance corresponding to the governor-tripping speed used.

Car Construction for Electric Passenger Elevators

Par. 9124. Cars of electric passenger elevators shall have metal car frames and metal outside frames of platforms. They shall run in guides and shall be guided at the top and bottom. The guiding members shall have sufficient strength to withstand the reactions resulting from the normal loading and operation of the car and from the operation of the car safety.

The stresses in frames made of rolled steel which meets the requirements of Paragraph 6310, or of annealed cast steel which meets the requirements of Paragraph 6313, based on the static load imposed on them, shall not exceed the values given in Table 9124T.

TABLE 9124T

Types of Stress	Allowable Stress in pounds per sq. in.	Basis
Tension	10,000	Net area
Bending	10,000	Gross section
Shear on shop rivets.............	8,000	Net area
Bearing on shop rivets...........	16,000	Net area
Shear on bolts in clearance holes..	7,000	Gross section
Bearing on bolts in clearance holes	14,000	Gross section
Bolts or threaded portions of rods in tension	10,000	Net section
Compression	11,700—49 l/r	Gross area

l=unsupported length of member in inches.
r=least radius of gyration in inches.

For steels of greater strength, the allowable stresses may be increased in proportion to the increase of their ultimate strength over that of the steels specified above.

The members of frames shall be securely bolted, riveted or welded together in accordance with all of the applicable requirements in Part VI.

Cast iron shall not be used for any member of a car frame or platform which is subject to tension or bending, except for compensating cable anchorages, releasing carriers and guide-shoe stands.

When material other than steel is used for car frames or platforms, the stresses shall not exceed 0.13 of the ultimate strength of the material.

Local reductions in section of a member in bending through bolt holes for the fastening of hoist-rope or compensating-rope hitches, auxiliary apparatus on the crosshead or plank, sheave boxes, and the fastening of platform to plank, need not be considered. Holes in webs of crosshead for sheave pins shall be reinforced by means of a plate, at least as thick as the web, riveted or welded to it.

The deflection of the crosshead and the safety plank shall not exceed one-eighth inch in each 10 feet of span under static conditions with contract load substantially uniformly distributed over the car platform.

The slenderness ratio l/r for members not normally subject to compression shall not exceed 250; for members normally subject to compression this ratio shall not exceed 120.

When car-leveling devices are used the car platform shall be provided with a substantial vertical face flush with its outer edge, extending a sufficient distance below the car floor so that there shall be no horizontal opening into the hoistway while the car is within the landing zone and the hoistway door is wholly or partially open.

Elevator cars shall be lighted at all times when in use to an intensity of at least one foot-candle at the threshold.

No glass shall be used in elevator cars except to cover certificates, lighting fixtures, and appliances necessary for the operation of the car and as a vision panel in the car.

Every piece of glass, except for lighting fixtures, which exceeds one square foot in area shall be laminated or otherwise made shatterproof.

Lighting devices or luminaries provided with shades, reflectors, or glassware shall be of railroad-train-lighting type with integral base, husk and spring clamp holder. If suspended glass bowls or plates are used, they shall rest in and be fastened to a metal supporting ring provided with at least a three-point suspension. Such glass shall not be drilled for attachment to ring suspension.

Glassware larger than 10 inches in diameter for passenger elevator lighting devices shall be laminated or shall be of wired glass or surrounded by a guard of wire not less than 0.028 inches in diameter and of a mesh that will not pass a one-half inch diameter ball. Guards shall be securely fastened to holder or suspension. The total area of glass used with lighting fixtures shall not exceed 4 square feet.

When two single elevators are installed in a single hoistway, both elevators shall be equipped with all the safeguards required by this Code for a single elevator, both with relation to each other and to top and bottom terminals.

Cars for electric passenger elevators shall be enclosed at the sides and top, except the opening necessary for entrance or exit. An emergency exit shall not be considered a car opening.

No part of an electric passenger-elevator-car enclosure shall deflect so as to reduce the actual running clearance below the amount specified in Paragraph 9121 or to exceed one-half inch when subjected to a force of 75 pounds applied horizontally at any point. The car enclosure shall be secured to the car floor and sling in such a manner so that it cannot work loose or become displaced in ordinary service.

The use of cast iron for tops of elevator cars is prohibited.

Electric passenger-elevator-car enclosures of non-fireproofed wood or other combustible material shall be covered on the exterior, including the tops, with sheet metal at least 0.0172 inches thick. Openings in the sides or top of passenger-elevator-car enclosures, other than those required for entrances, emergency exits and ventilation, are prohibited. Ventilation openings which are less than 7 feet above the car platform shall reject a ball 2 inches in diameter.

No electric passenger-elevator-car shall have more than two entrances.

Electric passenger-elevator cars shall be provided with an emergency exit, located in the top of the car, with an area of not less than 400 square inches and at least a dimension of not less than 16 inches.

Top exit panels shall be held in place by thumbscrews arranged so that the exit covers can be readily opened from both the inside and outside of the car. Top exit covers shall open outward. Any equipment mounted above the top of the car shall be so located as not to obstruct or interfere with the proper access to the emergency exit.

Where there is an elevator in an adjacent hoistway without intervening enclosures, an emergency exit or exits shall also be located in the side of the car adjacent to each such adjoining car.

Side emergency exits shall comply with the following requirements:

Exit panels shall be either of the hinged or removable type.

Exit panels shall not open outward.

The removable type of exit panel shall be held securely in place by not less than 4 fastenings arranged so that they can be operated by hand from both the inside and outside of the car, and so constructed that they cannot readily be removed from the panel.

The hinged type of panel shall be provided with a lock arranged so that it may be operated from the inside of the car by means of a removable key, and from the outside of the car by means of a non-removable handle. A key shall be provided in each car and shall be mounted under a break-glass cover, or fastened with a chain.

Where the size of the car permits, side exits shall have a clear width of not less than 16 inches and shall extend from the floor or kick plate to the soffit molding frame, but in no case shall they be less than 5 feet in clear height.

Side exits shall be located so that they are not obstructed by car-frame members, so that the clear effective area is not less than 85 per cent of the gross area, and, wherever possible, so that traveling cables and other hoistway equipment will not be in line with or obstruct the exit. Exits from adjacent cars shall be directly opposite each other.

Exit panels shall conform to the deflection requirements for the enclosure.

On automatic-operation elevators side exits shall be provided with electric contacts to prevent the operation of the car when the panel is opened or removed.

A car door or gate shall be provided at each entrance to electric passenger cars. This door or gate when closed shall guard the full opening and shall be provided with a car-door or gate electric contact.

For automatic-operation elevators, car gates of the scissors or pantograph type shall not be power-opened.

Car doors and gates shall be of such design and construction and so supported that they will not deflect beyond the line of the car platform threshold when a force of 75 pounds is applied at the center of the door panel or the center of the gate when the gate is fully closed.

For elevators employing a type of operation not requiring the presence of an operator in the car, power car-doors or gates other than those closed by hand shall be driven by a mechanism so designed and set that the force necessary to prevent the closing of the gate shall not exceed 30 pounds and, further, that the kinetic energy of the gate plus all parts connected rigidly thereto, computed for the average closing speed, shall not exceed 5 foot-pounds, provided that if the same mechanism also closes the hoistway door, the total kinetic energy shall not exceed 7 foot-pounds.

For automatic-operation elevators having power-closed or automatically released self-closing car doors or gates and manually closed or self-closing hoistway doors, the closing of the car gate shall be prevented unless the hoistway door is in the closed position.

For automatic-operation passenger elevators, the car gate or door shall be located so that the distance from the face of the hoistway door to the face of the car door or gate shall be not more than the following:

From a swinging hoistway door to a car gate, 4 inches.

From a swinging hoistway door to a car door, 5½ inches.

From a sliding hoistway door to either a car gate or door, 5½ inches.

The distance from the face of the hoistway door to the face of the car door or gate shall be measured as follows:

If the car and hoistway doors are sliding doors of multi-sections or if one of these doors is of multi-sections and the other is a single section, between the sections of the two doors nearest to each other.

If the car door is of multi-sections and the hoistway door is of the swinging type, between the hoistway door and the section of the car door farthest from it.

If a car gate is used, between the car gate and that part of the hoistway door nearest to the car gate.

Car gates used for passenger elevators shall be of such design that when fully expanded, they will reject a ball 3 inches in diameter.

A weight used to automatically close a door or gate shall run in metal guides from which it cannot become dislodged, or it shall be boxed in. The bottoms of the guides or boxes shall be so constructed as to retain the weight if the rope breaks.

Sliding car doors for electric passenger elevators may be solid or they may have open grilles or bars, if the openings thereof reject a ball one and one-half inches in diameter, or glass vision panels if in accordance with this Paragraph. Grilles, bars or glass may extend the full height of the door panel.

Sliding car doors shall be guided top and bottom.

Hangers for power-operated car doors shall be designed to withstand a downward thrust of five times the weight of the door and an upward thrust of four times the weight of the door.

An electric contact shall be installed on the car door or gate to prevent the operation of the car by the normal operating device unless the door or gate is in the closed position. The door or gate shall be considered to be in the closed position when the clear open space between the edge of the door or gate and the nearest face of the jamb does not exceed 2 inches, except that where the car door or gate is provided with a door closer and interlocks and the requirements specified in Paragraph 9112 for hoistway doors equipped with door closers are fully met, the electric contact on the car door or gate may permit the starting of the car when the car door or gate is within 4 inches of full closure against the jamb.

The car-door or gate electric contact shall not prevent the operation of the car when the emergency release is in temporary use or when the car is being moved by a leveling device.

Car-door or gate contacts shall be designed so that they are positively opened by a lever or other device attached to, and operated by, the door or gate.

The functioning of a car-door or gate contact to prevent the movement of the car shall not be solely dependent on the action of a spring, nor on gravity, nor upon the closing of an electric circuit. If springs are used they shall be in compression.

The testing, approval and marking of each type and make of car-door or gate electric contact shall be in accordance with the requirements of Paragraph 9113 for hoistway door electric contacts.

Provision shall be made to render the passenger car operative independent of the position of the car gate or door in case of fire, panic or other similar emergency by means of an emergency release conforming to Paragraph 9128, except that elevators which can be started from a landing shall not be provided with an emergency release unless equipped with a car switch for dual operation, in which case, an emergency release shall be installed which shall be so arranged that when the car is operated without an operator in the car, the emergency release shall be inoperative. This emergency release shall be separate and independent from the emergency release required by Paragraph 9128 and shall be placed within 5 inches of such other emergency release.

Car and Counterweight Safeties and Speed Governors for Electric Passenger Elevators

Par. 9125. Passenger-elevator cars suspended by cables shall be provided with a safety or safeties attached to the car frame, one of which shall be located beneath the car platform, capable of stopping and sustaining the car with contract load.

The application of the safety shall not cause the car platform to become out of level in excess of one-half inch per foot, measured in any direction.

Car safeties shall be operated by speed governors. When the car safety is applied no decrease in the tension of the governor cable, or any motion of the car in the descending direction, shall release the car safety.

Jaws and other parts of safeties of the sliding type, made of forged steel of an ultimate strength of not less than 55,000 pounds per square inch, or cast steel of an ultimate strength of not less than 65,000 pounds per square inch, shall, in action, not be stressed beyond 17,000 pounds per square inch for tension, flexure or compression.

Bearings for drums and screw-shafts shall be of non-ferrous material.

The car speed governor shall be set to cause the application of the safety at a speed not more than 40 per cent and not less than 15 per cent above the contract speed, except that governors shall not be required to trip at speeds less than 175 feet per minute. For a contract speed exceeding 500 and not exceeding 700 feet per minute, the governor tripping speed shall be not more than 33-1/3 per cent above the contract speed, and for contract speed exceeding 700 feet per minute, not more than 25 per cent above the contract speed.

Car and counterweight safeties for electric passenger elevators shall be of the following types:

Type I. Instantaneous.

Type W. C. Wedge Clamp—produces a constant retarding force.

Type G. W. C. Gradual Wedge Clamp—produces a gradually increasing retarding force.

Type F. G. C. Flexible Guide Clamp—produces a constant retarding force.

Each safety shall be marked for identification, preferably with letters cast on the safety jaws.

The distance between the safety jaws shall not be less than the thickness of the guide rail plus 3/32 inch. The jaws shall be installed so as not to drag against the rail.

Safeties shall be marked by the manufacturer with the range of weight and speed for which they are designed; said weight to include the complete car structure, the safety, the contract load in the car, and all moving equipment the weight of which is borne by the safety.

A safety of the instantaneous type shall not be used on elevator cars having a contract speed in excess of 100 feet per minute, or on up-speed, with the contract load, in excess of 110 feet per minute.

No car safety shall be permitted for stopping an ascending car, except above the terminal landing provided the retardation of the ascending car does not exceed 32.2 feet per second per second. If an ascending car is to be stopped on account of overspeed, a safety shall be applied to the counterweight or the governor may be arranged to open the motor circuit and apply the brake.

No car safety which depends on the completion or maintenance of an electric circuit for the application of the safety shall be used. Car safeties shall be applied mechanically.

The gripping surfaces of car or counterweight safeties shall not be used to guide the car or counterweights.

A pawl and ratchet shall not be considered a sufficient safety device.

The counterweight safety, if provided, shall be permitted to be operated by the same governor and governor rope that is used to operate the car safety. Provisions shall be made to cause the application of the counterweight safety at a speed greater than that at which the car safety is applied, but not more than 10 per cent above that speed. Broken-rope safeties of the instantaneous type shall not be used on counterweights if the speeds and corresponding weights are greater than shown in Table 9125T.

TABLE 9125T

Contract Speed Feet per Minute	Total Weight of Counterweight in Pounds
250	2000
200	3000
160	4000
125	5000

Reversing the direction of the elevator machine shall be permitted to release the safeties.

The governor shall be located where it cannot be struck by the car in case of overtravel and where there is sufficient space for full movement of the governor parts.

The motor-control circuit and the brake-control circuit shall be opened before or at the time the governor trips.

The governor cable shall be of iron, steel, monel metal, or phosphor bronze, not less than three-eighths inch in diameter. Tiller-rope construction shall not be used for governor cables, except for that portion of the cable which is wound on the safety drum. Such portion shall be of corrosion-resistant metal.

Governor ropes shall run clear of governor jaws during the normal operation of the elevator.

The size, material and construction of the governor rope, together with the proper tripping speed of the governor, shall be stamped on the governor stand, or given on a brass plate attached to it, in letters not less than one-quarter inch in height.

The arc of contact between the governor rope and the driving sheave shall, in conjunction with a tension device, provide sufficient traction to cause proper operation of the governor.

The minimum length of governor jaws shall be such that no serious cutting, tearing, or deformation of the rope shall result from the operation of the safety.

Elevators having winding-drum machines shall be provided with a slack-cable device which will cut off the power and stop the elevator machine if the car is obstructed in its descent. Slack-cable switches shall be so constructed that they will not automatically reset when the slack in the cable is removed.

Machines, Machine Safeties and Terminal Stopping Devices for Electric Passenger Elevators

Par. 9126. Drums and leading sheaves of electric passenger elevators shall be of cast iron or steel, and shall have finished grooves. U-grooves shall be not more than one-sixteenth inch larger than the cables.

The diameter of sheaves and drums for hoisting and counterweight cables shall be not less than 40 times the diameter of the cable.

Openings in drums shall be drilled at an angle of not more than 45 degrees with the run of the cable and provided with a rounded corner with a radius at least equal to that of the cable.

The factors of safety based on static loads, to be used in the design of elevator hoisting machines shall be not less than:

8 for wrought iron or wrought steel
10 for cast iron, cast steel, or other materials.

Set-screw fastenings shall not be used instead of keys or pins if the fastening is subject to tension or torsion.

Friction-type gearing or clutch mechanisms shall not be used for fastening the drums or sheaves to the main driving gear.

Worm-gearing having cast-iron teeth shall not be used.

Winding-drum and traction machines for electric passenger elevators shall be equipped with brakes applied automatically by springs or gravity when the operating device is at the "stop" position. Electric elevator machines shall be equipped with electrically released brakes.

Brakes shall not be released until the power has been applied to the motor.

A single ground, short-circuit, or counter-voltage shall not prevent the action of the brake magnet from allowing the brake to set in the intended manner during normal operation.

A motor-field discharge, counter-voltage, single ground, or accidental short-circuit shall not retard the action of the brake magnet in allowing the brake to set during emergency stops.

Electric passenger elevators shall be provided with upper and lower normal terminal stopping devices, arranged to automatically stop the car from any speed attained in normal operation within the top and bottom overtravel independently of the operating device, the final terminal stopping device and the buffers.

Normal terminal stopping devices shall be as follows:

For winding-drum machines; stopping switches installed on the car or in the hoistway operated by the movement of the car.

For traction machines; stopping switches installed on the car, or in the machine room, or in the hoistway operated by the movement of the car.

If located in the machine room, the stopping contacts shall be mounted on and operated by stopping devices mechanically connected to the car, with no dependence on friction as a driving means. An automatic safety switch shall be provided which will stop the machine should the tape, chain, rope or other similar device, mechanically connecting the stopping device to the car, fail.

In the case of elevators using floor controllers or other similar devices for automatic stopping at floor landings, only one set of floor-stop contacts is necessary for each terminal landing, provided these contacts and the means for operating them comply with the requirements for terminal stopping devices. These contacts then serve also as normal terminal stopping devices.

Electric passenger elevators shall be provided with upper and lower final terminal stopping devices arranged to automatically stop the car and counterweight from the contract speed within the top clearance and bottom overtravel independently of the operation of the normal terminal stopping devices and the operating device, but with buffers operative.

Final-limit switches shall be set to operate with the car as close to the terminal landing as practical without interfering with the normal operation of the elevator, except that where means are provided to prevent jumping of the car or counterweight, they may be set to open before the buffer is fully compressed. Where spring buffers are provided, the final-limit switches shall be set to open before the buffer is engaged.

Final terminal stopping devices shall be as follows:

For winding-drum machines; stopping switches installed on the machines and also in the hoistway operated by the movement of the car.

For traction machines; stopping switches installed in the hoistway operated by the movement of the car.

The final terminal stopping devices shall act to prevent movement of the car in either direction of travel. The normal and final terminal stopping devices shall not control the same switches on the controller unless two or more separate and independent switches are provided, two of which shall be closed to complete the motor and brake circuit in each direction of travel. When two-phase or three-phase alternating current is used to operate the elevator, the above switches shall be of the multiple type.

When the final terminal stopping device controls the same controller switch or switches as those controlled by the operating device or the normal terminal stopping device, it shall be connected into the control circuit on the opposite side of the line.

Chain-, rope-, or belt-driven machine terminal stopping devices shall not be used for electric passenger elevators having winding-drum machines.

Elevators having winding-drum machines driven by two-phase or three-phase alternating-current motors, except elevator machines with alternating-current motors and direct-current brakes and direct-current main-line or potential switches controlled by final terminal hoistway stopping switches, shall have a main-line circuit to the motor and brake directly opened either by contacts in the machine stop-motion switch or by hoistway limit switches operated by a cam attached to the car. The opening of these contacts shall take place before or coincident with the opening of the final terminal stopping device and shall prevent movement of the machine in either direction.

Normal and final terminal stopping switches, whether on the car or in the hoistway, shall be of the enclosed type.

Normal and final terminal stopping devices, whether on the car or in the hoistway, shall be securely mounted in such a manner that the movement of the switch lever or roller to open the contacts shall be as nearly as possible in a direction at right angles to a line drawn between the faces of the car guide rails.

The cam or cams for operating the normal and final terminal stopping switches shall be of metal and so located and of such length as to maintain the switch in the open position when the car is in contact with the overhead structure or resting on the fully compressed buffer with the overhead structure and the buffer in their normal position.

The contacts of all terminal stopping devices shall be opened by direct mechanical means. Arrangements in which

Hoisting cables less than one-half inch in diameter shall not be used for electric passenger elevators.

The minimum number of hoisting cables used with traction elevators shall be three and for winding-drum elevators, two for the car and two for each counterweight.

Cable equalizers and their fastenings, except equalizers of the single swingle-tree type used with drum-type machines and equalizers of the individual-compression-spring type capable of being fully compressed without failure, shall be approved by the Buildings Engineer on the basis of tests made by an approved testing laboratory. Such tests shall show the ultimate strength of the component parts and of the assembly of the equalizer and its fastenings. No equalizer shall be used unless such ultimate strength is at least 10 per cent in excess of the ultimate strength of the cables.

All cables anchored to a winding drum shall have not less than one turn of cable on the winding drum when the car or counterweight has reached the extreme limit of its overtravel.

Car or counterweight cables shall not be repaired or lengthened by splicing.

The winding-drum ends of car or counterweight cables shall be secured by clamps on the inside of the drums or by one of the following methods.

The car and counterweight ends of cables shall be fastened either by return loops or by individual tapered babbitted sockets.

If socketed cable fastenings are used, adjustable shackle rods shall be provided to attach cables to cars and counterweights in such a manner that all portions of the cable not in the socket shall be readily visible.

Method of Making Return Loops: To form a return loop at the counterweight or car, without cutting the cable, each end of a continuous cable shall be secured to the winding drum, to the car or to the counterweight, and the loop shall be passed around a metal thimble closely fitting the cable and immediately above the thimble, a clamp shall be placed on the double cable and securely bolted to prevent slipping of either leg of the cable through the clamp should the opposite leg be entirely released.

Method of Socketing Cables: Babbitted sockets shall be not less than 4.75 times the diameter of the cable. The hole at the small end shall be as given in Table 9127T.

a spring or gravity opens the contact on withdrawal of a cam, lug or similar member, are prohibited.

Cables and Cable Equalizers for Electric Passenger Elevators

Par. 9127. Car and counterweight cables for electric passenger elevators shall be of iron or steel without covering. Chains shall not be used for hoisting the car.

The number of cables, their diameter in inches and their ultimate strength in pounds shall be placed on the metal plate required in Paragraph 9122 and on a metal tag, attached to the cable fastenings. The kind of material in the cables, the date of installation of the cables and the fact that they are preformed, if such is the case, shall also be placed on the tag.

Where the rated ultimate strength and material of the cables are not known, the allowable loads shall be limited to the loads allowed for iron cables of the same diameter.

The factor of safety, based on static loads, for car and counterweight cables for electric passenger elevators shall be not less than the values given in Diagram 9127D, corresponding to the contract speed of the car.

DIAGRAM 9127D

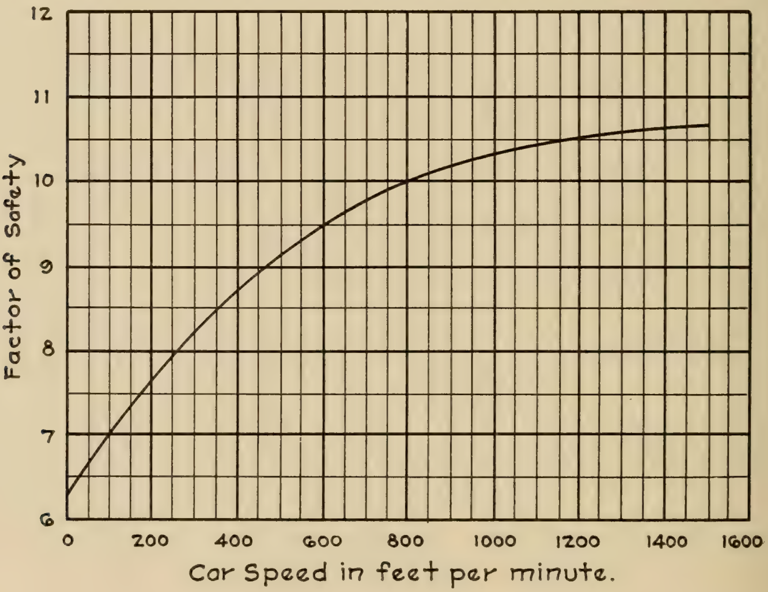


TABLE 9127T

Nominal Diameter of Cable in Inches	Inside Diameter of Small End of Cable Socket
¼ to 7/16 inclusive	shall not be more than 1/16 inch larger than actual cable diameter
½ to ¾ inclusive	shall not be more than 3/32 inch larger than actual cable diameter
⅞ to 1⅛ inclusive	shall not be more than ⅛ inch larger than actual cable diameter
1¼ to 1½ inclusive	shall not be more than 3/16 inch larger than actual cable diameter

The edges of the hole at the small end of the socket shall be rounded and free from cutting edges. The hole at the large end of the socket shall be not less than 2.25 times the diameter of the cable. The socket shall be of drop-forged steel or cast steel and of such strength that under tension the cable will break before the socket is preceptibly deformed.

Cable ends to be socketed shall be served with three seizings at each side of any place where the cable is to be cut.

Only annealed iron wire shall be used as seizing wire. The wires shall be wound tight and even. The twisted ends of the seizings shall be so placed that they will fall into the valleys between strands and away from the end of the cable.

For ⅝ inch or smaller cable, the first two seizings shall be not less than ½ inch long, and the third seizing not less than ¾ inch long. For larger cables, proportionately longer seizing shall be used. The first seizing shall be close to the cut, and the second seizing shall be spaced back from the first seizing a distance equal to the length of the end of the cable wire to be turned in. The third seizing shall be at a distance from the second seizing equal to the length of the socket.

Under no circumstances shall tape be used as a substitute for the annealed-iron-wire seizing.

The cables thus served shall be entered at the small hole and slipped into the socket a sufficient distance for manipulating, and after removing the first two seizings the strands shall be opened up and the hemp center cut out, as close as possible to the remaining seizing, and removed.

Then all grease shall be carefully removed by wiping off the extended strands, and by washing with a solvent. The ends of the strands shall then be bent and turned in and bunched close together. The portion turned in shall have a length not less than two and one-half times the cable diameter. The cable shall be pulled back into the socket so that bends of the turned-in wires are flush or slightly over-flush with the mouth of the socket. The third seizing shall slightly project outside the hole at the small end of the socket.

The socket, now being ready for the pouring of the babbitt, shall be held vertical and truly axial with the cable to be socketed. Clean babbitt, free from dross, shall be used, heated to a temperature just sufficient to produce fluidity and to char a piece of soft wood without igniting it.

Controls for Electric Passenger Elevators

Par. 9128. Electric passenger elevators shall not be operated by a hand-operated rope, cable or rod, or by a wheel or lever mechanism.

The handle of car-switch operating devices shall be arranged to return to the "stop" position and lock there automatically when the hand of the operator is removed from the handle.

If more than one operating device is used in a car, except in automatic-operation elevators, the operating devices shall be so interlocked that only one can be used at a time. If a single operating device is used, it shall be so located as to be near the car opening serving the greatest number of landing openings.

An emergency stop switch or button which will cut off the power shall be provided in the car adjacent to the operating device for all electric elevators. A self-restoring type of switch or button may be used as an emergency stop switch only with automatic operation. Where a self-restoring switch or button is used, and the car has been started from within the car, releasing the switch or button shall not permit restarting the car, except by the operating device in the car, unless the car gate or hoistway landing door has been opened and closed. Switches and buttons shall be plainly marked "Stop" and the operating button or handle shall be of a different color from that of any other switch or handle in the car. Contacts of emergency stop switches or buttons shall be opened by direct mechanical means and shall not be dependent upon springs for the opening of the contacts.

Where a winding drum machine is used, the traveling cable wires leading to the emergency stop switch shall be arranged and connected so that a short circuit between the wires in any traveling cable will not result in a short circuit of the emergency stop switch.

Where metal-to-metal contacts, either gravity of spring opened or a combination of the two, are used on controller switches for stopping an elevator machine, at least two independent breaks shall be provided.

The operation of a spring or springs in tension, or the completion of another electric circuit, shall not be depended upon to break the cricuit to stop an automatic-operation elevator at the terminals.

No control system shall be used which depends on the completion or maintenance of an electric circuit for the interruption of the power and the application of electromechanical brakes at the terminals, for the operation of safeties, or for the closing of a contactor by an emergency stop button. This regulation shall not be interpreted to apply to dynamic-braking or to speed-control devices.

Car-switches shall be so arranged that the movement of the handle toward the car door or gate which the operator usually faces will cause the car to descend and the movement of the handle away from the door or gate will cause the car to ascend.

Continuous-pressure operation shall not be used for passenger elevators unless they are provided with all of the safety devices required for automatic operation.

When an overload circuit-breaker is used for a direct current electric elevator, the wiring shall be arranged so that the circuit of the brake-magnet coil is opened at the same time that the line circuit is opened.

Automatic-operation electric passenger elevators shall conform to the following requirements:

If the car has started for a given landing, it shall be impossible to give an impulse from any landing to send the car in the reverse direction until the car has reached the destination corresponding to the first impulse. This, however, shall not prevent stopping the car at any intermediate landing to take on or discharge passengers going in the original direction.

If the car has been stopped to take on or discharge passengers and is to continue in the direction determined by the first impulse, it is permissible to start the car by closing the car gate.

It shall be impossible to start the car under normal operation unless every hoistway door is closed and locked in the closed position.

An inspector's switch shall be installed on the controller to render all landing buttons inoperative. If the opening of the emergency stop switch or button does not cancel all registered car and landing calls, the inspector's switch shall also render all car buttons inoperative, and in addition, there shall be furnished in the car an "Up" and "Down" inspection switch or button which will enable the inspector to operate the elevator in either direction as long as the switch or button is held in contact.

They shall be provided with an audible emergency signal that is operative from the car and located outside of the hoistway or with a telephone. Unless the telephone is permanently connected to a central exchange, the telephone signal or the emergency signal shall be clearly audible at all times to some person who is continuously on duty while the elevator is in service.

Special speed-control or retarding devices installed in connection with reduced-stroke buffers shall meet the requirements of Paragraph 9123.

Provisions shall be made to render the car operative, independent of the position of the hoistway doors, in case of fire, panic or other similar emergency by means of an emergency release, except that elevators which can be started from a landing shall not be provided with emergency release unless equipped with a car switch for dual operation, in which case an emergency release shall be installed but so arranged that when the elevator is operated without an operator in the car the emergency release shall be inoperative.

The emergency release shall be in the car, plainly visible to the occupants of the car and easily accessible to the operator.

The emergency release shall be provided with a break-glass cover and means for breaking the glass.

To operate the car under emergency conditions, it shall be necessary for the operator to break the glass and to hold the emergency release in the operative position.

The emergency release shall be constructed so that it cannot readily be tampered with or plugged in the release position. Rods, connections and wiring used in the operation of the emergency release, that are accessible from the car, shall be enclosed and protected from injury. Broken glass covers shall be replaced before the car is again placed in regular service after the emergency.

Tests for Electric Passenger Elevators

Par. 9129. Every electric passenger elevator before being placed in regular service shall be subjected to a contract-load test and a car and counterweight safety test made under the supervision of the Buildings Engineer. Approval of any such elevator shall be granted only upon satisfactory completion of such tests.

The contract-load test shall be made with the contract-load in the car and shall test the functioning of the brakes, limit switches, buffers, car safety and speed governor.

The car and counterweight safety test shall determine whether the safeties stop the car and counterweight within the limits of the maximum and minimum stopping distances, measured by the actual slide as indicated on the guide rails, hereinafter specified. Such tests for the various type of safeties shall be made under the following conditions:

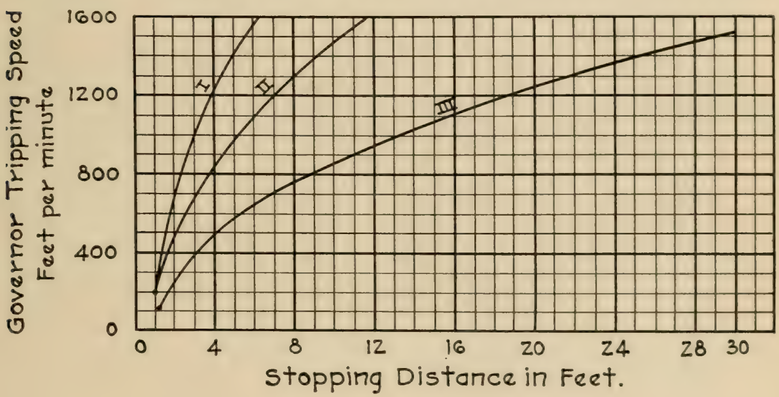
For Type W.C., Type G.W.C. and Type F.G.C.—at runway or overspeed with the contract load in the car and also at contract speed with a 150-pound load in the car.

For Type I, governor-controlled type—at contract speed with the contract load and also with a 150-pound load in the car, the governor being tripped by hand.

For Type I, broken-rope type—by obtaining the necessary slack rope to cause the safety to function.

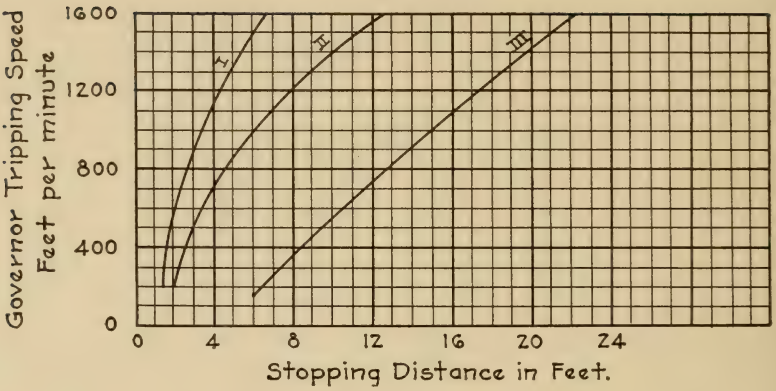
The maximum stopping distance of car and counterweight for safeties of Type W.C. shall be as shown in Diagram 9129D1 by Curve III for cars with the contract load and for the counterweight, and the minimum stopping distance shall be as shown by Curve I for cars with a 150-pound load, and by Curve II for cars with the contract load and for the counterweight.

DIAGRAM 9129D1



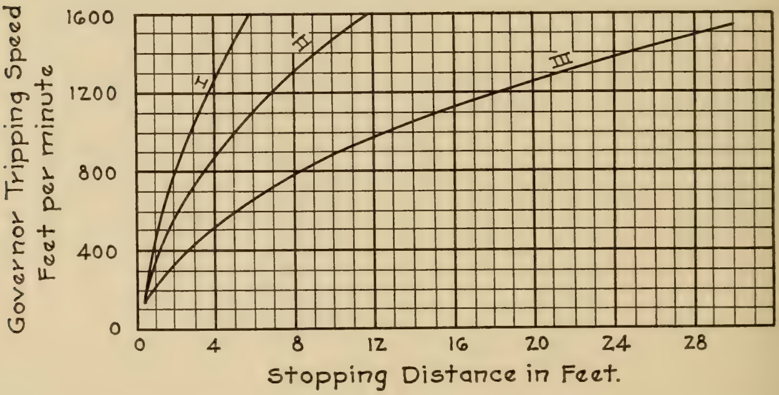
The maximum stopping distance of car and counterweight for safeties of Type G.W.C. shall be as shown by Curve III in Diagram 9129D2 for cars with the contract load and for the counterweight, and the minimum stopping distance shall be as shown by Curve I in Diagram 9129D2 for cars with a 150-pound load, and Curve II for cars with the contract load and for the counterweight.

DIAGRAM 9129D2



The maximum stopping distance of the car and counterweight for safeties of Type F.G.C. shall be as shown by Curve III in Diagram 9129D3 for the car with the contract load and for the counterweight, and the minimum stopping distance shall be as shown by Curve I in Diagram 9129D3 for the car with a 150-pound load, and Curve II for the car with the contract load and for the counterweight.

DIAGRAM 9129D3



For elevators having a contract speed of 475 feet per minute or above, the pull-out of the governor cable from its normal running position until the safety jaws begin to apply pressure to the guide rails shall not exceed 30 inches.

The runaway or overspeed test shall be made with the cables attached and all electric apparatus operative, except for the overspeed contact on the governor.

For alternating current elevators, where the contract load is unable to bring about overspeed the safety governor shall be tripped by hand at maximum obtainable speed.

For periodic tests of car safeties refer to Paragraph 9107.

SECTION 913

ELECTRIC FREIGHT ELEVATORS

General Requirements for Electric Freight Elevators

Par. 9130. Sidewalk elevators having a travel of 30 feet or less are not required to comply with the requirements of this section, unless they are specifically referred to in this section.

Elevators intended for both passenger and freight service shall be constructed, installed and operated in conformity with the requirements for passenger elevators.

Electric freight elevators, except automatic-operation and continuous-pressure-operation elevators and elevators controlled by a regular operator, shall not have a contract speed in excess of 100 feet per minute.

The contract speed of electric freight elevators with continuous-pressure operation shall not exceed 150 feet per minute.

Clearances for Electric Freight Elevators

Par. 9131. There shall be a clearance of not less than three-quarters inch between the sides of the car of electric freight elevators and the hoistway enclosure and of not less than one inch between the car and its counterweight.

The clearance between the car platform and the landing sills shall be not less than one-half inch for elevators where steel guide rails with side-post construction are used and three-quarters inch for all elevators where wood guide rails or corner-post construction is used. The clearance in each case shall not exceed one and one-half inches.

The clearance between the hoistway enclosure and the loading side of the car platform shall be not more than 5 inches, except where the doors are installed wholly within the hoistway, in which case the clearance shall not exceed 7½ inches, and except where the cars have doors or gates equipped with electric contacts.

If two or more cars operate in adjacent hoistways, the clearance between cars shall be not less than 2 inches.

A pit shall be provided at the bottom of every electric freight elevator hoistway. The requirements for such pits shall be in accordance with the requirements for electric passenger elevator pits in Paragraph 9121, except that for sidewalk elevators the pit need not be more than 2 feet deep and the minimum clearance of 2 feet between the lowest projection on the underside of the car and the floor of the pit, or any obstruction in the pit, when the car rests on the fully compressed buffers, may be modified accordingly.

The top clearance for the car and the top clearance for the counterweight of electric freight elevators shall be in accordance with the requirements for such clearances for electric passenger elevators in Paragraph 9121, except for electric sidewalk elevators, where the overtravel need not be more than 6 inches at the top and 3 inches at the bottom.

Capacity and Loading for Electric Freight Elevators

Par. 9132. The capacity of each freight elevator shall be indicated on a metal plate in a conspicuous place in the car, in letters and figures not less than one inch high, by the word "CAPACITY", followed by figures giving the contract load in pounds.

A metal plate bearing the following information shall be placed upon the crosshead:

> The weight of the complete car, including the safeties.
>
> The contract car speed in feet per minute at which the elevator is designed to travel.
>
> The cable data as required in Paragraph 9137.

Electric freight elevators shall not be used for carrying safes or other one-piece loads heavier than the contract load of the elevator unless the following requirements are complied with:

> A locking device shall be provided which will hold the car at any landing independently of the hoisting cables while the safe or other object is being loaded or unloaded.
>
> The locking device shall be so designed that it cannot be unlocked unless the entire weight of the car and load is suspended on the cables.
>
> The wrench or other device for operating the locking device shall be removable.
>
> The locking device shall be designed to withdraw the bars should it come in contact with the landing locks if the car is operated on the up motion.

A metal plate shall be provided in the elevator car which bears the words "Capacity Lifting Safes" in letters followed by figures, giving the capacity in pounds for lifting safes for which the machine is designed, the letters and figures to be not less than one-quarter inch high, stamped, etched, or raised on the surface of the plate.

The car platform, car frame, sheaves, sheave beams, shafts, cables, and locking device shall be designed for the specified "Capacity Lifting Safes" with a factor of safety of not less than 5.

The car safeties shall be designed to stop and hold the specified "Capacity Lifting Safes" with the cables intact.

Where there is a passageway under the hoistway, the machine shall be designed to operate with the "Capacity Lifting Safes" at slow speed, and the car safety shall be designed to stop and hold the car and "Capacity Lifting Safes" independently of the cables.

For traction machines additional counterweight shall be added so that the total overbalance is at least equal to 45 per cent of the "Capacity Lifting Safes".

The "Capacity Lifting Safes" of any traction elevator shall not exceed one and one-third times the contract load of the elevator.

All elevator machines equipped for carrying safes or other one-piece loads greater than the contract load of the elevator shall be provided with a special switch near the machine for operating under such conditions.

Counterweights, Guides and Buffers for Electric Freight Elevators

Par. 9133. The counterweights of electric freight elevators shall run in guides and shall be guided at the top and bottom. The guiding members shall have sufficient strength to withstand the reactions resulting from the normal operation of the counterweight and from the operation of the counterweight safety where provided.

If two counterweights run in the same guides, the car counterweight shall be above the machine counterweight and there shall be a clearance of not less than 8 inches between the counterweights. The cable of the machine counterweight shall be covered or protected by metal or fiber sleeves firmly attached to the cable. These sleeves shall be not less than 6 inches longer than the car counterweight. The ends of metal sleeves shall be carefully reamed before being placed on the cables.

If an independent car counterweight is used, it shall not be of such a weight as to cause undue slackening in any of the cables during acceleration or retardation of the car.

Counterweight sections, whether carried in frames or not, shall be secured by at least two tie rods passing through holes in all the sections. The tie rods shall have lock nuts at each end. The lock nuts shall be secured by cotter pins.

Where winding drum machines are used, a permanent beam or bar shall be provided at the top of the counterweight guides and beneath the counterweight sheaves to prevent the counterweight from being drawn into the sheaves. It shall be of such strength that the cables will be pulled out of the socket before there is failure of the beam. The bar or beam shall be located in line with the center of mass of the counterweight, or if more than one stop is used, they shall be located symmetrically with respect to the counterweight.

The car and counterweight guide rails of electric freight elevators shall be of steel, except that where the use of steel rails presents an accident hazard, as in chemical or explosive factories, wood guide rails may be used for any car travel or speed. They shall be of such size that they will withstand the application of the safeties when stopping the fully loaded car or the counterweight.

The weight of steel guide rails shall not be less than that required for electric passenger elevators in Paragraph 9123.

The cross-section of wood guide rails made of maple shall be not less than that given in Table 9133T.

TABLE 9133T

Maximum Permissible Total Weight of Car and Load per Pair of Guide Rails in Pounds	Cross-section of Each Guide Rail in Inches
5000	2 × 2½
8000	2⅝ × 3

Guide rails shall be securely fastened to iron or steel brackets or their equivalent, of such strength, design, and spacing that the guide rails and their fastenings shall not deflect more than one-fourth inch under normal operation.

Where the distance between rail supports is greater than 14 feet, the rail shall be suitably backed or bracketed to secure sufficient rigidity for satisfactory operation.

Joints of steel guide rails shall be:

Accurately machined with tongue and groove through the webs, and with the back of the flanges where the fishplates bear accurately machined at right angles to the tongue and groove and fitted with finished fishplates, each secured with not less than 4 substantial bolts through each rail; or

Accurately machined with tongue and groove through the webs at right angles to the base and through the flanges parallel to the base and fitted with fishplates, each secured with not less than 4 substantial bolts through each rail.

Guide rails and their fastenings shall be secured in position by clips or through bolts of not less than the sizes given in Table 9123T3.

The guide rails shall be extended at the top and bottom to prevent guide shoes running off in case the overtravel is exceeded.

Buffers of the spring, oil, or equivalent type shall be installed under the cars of electric freight elevators.

Spring buffers or their equivalent shall not be installed with elevators having a contract speed in excess of 200 feet per minute.

Oil buffers or their equivalent shall be installed with elevators having a contract speed greater than 200 feet per minute. The minimum total stroke of oil buffers shall be based on an average retardation of 32.2 feet per second per second, based on the governor tripping speed, and the maximum retardation, based on the governor tripping speed, shall be not in excess of 80.5 feet per second per second.

The required buffer stroke may be reduced subject to the approval of the Buildings Engineer provided speed-retarding devices are installed for retarding the car or counterweight to a definite reduced speed before the buffer is engaged. In such case the required buffer stroke shall be not less than the distance corresponding to a retardation of 32.2 feet per second per second from 120 per cent of such reduced speed rather than from governor tripping speed, provided that for contract speeds in excess of 500 feet per minute the buffer stroke shall be not less than 18 inches.

Speed-retarding devices, installed in connection with reduced-stroke buffers shall:

Be independent of the normal and final stop switches.

Provide a retardation of the ascending car not in excess of 32.2 feet per second per second.

Provide a stopping distance for the descending car of not less than that shown by Curve I or II in Diagrams 9129D1, 9129D2 and 9129D3.

Oil buffers shall be provided with means for gauging the amount of oil in them.

Buffers shall be located symmetrically with reference to the center of the car and arranged so that under ordinary operating conditions the car will not strike them, except as hereinafter provided.

Counterweight buffers similar to those required for cars shall be installed symmetrically under the counterweights of electric freight elevators.

Each type and size of oil buffer shall satisfactorily pass the following tests before being approved by the Buildings Engineer:

1. Retardation Test.
2. Oil Leakage Test.
3. Churning Test.
4. Plunger-Return Test.
5. Test for Lateral Movement of Plunger.

These tests shall be made according to the procedure and specifications in Paragraph 9104.

Approved buffers shall be marked by the manufacturer with the range of speed and load for which they have been approved.

Where a manufacturer's type includes buffers of the same general design, but having different strokes, if the longest-stroke buffer of a given porting has been tested and approved, the buffers of shorter strokes having the same load range may be approved by the Buildings Engineer without tests if he is satisfied that the portings provided in the shorter-stroke buffers will give the same values of retardation as the buffer tested.

Buffers shall be field tested after installation by running on to them with the contract load at not less than one-half contract speed with final limit switches operative, except as follows: if a buffer stroke has been reduced due to the use of a speed-retarding device, the car or counterweight shall be run on the buffer at not less than one-half the speed corresponding to the buffer stroke used.

Car or counterweight buffers of the spring-return type shall be provided with a switch, operated by the buffer, in case it is compressed more than 3 inches, and so connected in the control circuit that the speed of the descending car or counterweight shall not exceed one-half the contract speed unless the buffer plunger, when released, returns to within 3 inches of its normal position.

If spring-return buffers are precompressed, they shall be so installed that when the car is level with a terminal landing, the remaining buffer stroke shall be not less than 50 per cent of the gravity stopping distance corresponding to the governor-tripping speed used.

Car Construction for Electric Freight Elevators

Par. 9134. Cars of electric freight elevators shall have metal car frames and metal outside frames of platforms. They shall run in guides and shall be guided at the top and bottom. The guiding members shall have sufficient strength to withstand the reactions from the normal loading and operation of the car and from the operation of the car safety.

The stresses in frames made of rolled steel, which meets the requirements of Paragraph 6310 or of annealed cast steel, which meets the requirements of Paragraph 6313, based on the static load imposed on them, shall not exceed the values given in Table 9134T.

TABLE 9134T

Type of Stress	Allowable Stress in Lb. per sq. in.	Basis
Tension	12,000	Net area
Bending of car frame members and platform framing at entrance..	12,000	Gross section
Bending of platform stringers....	15,000	Gross section
Shear on shop rivets.............	9,500	Net area
Bearing on shop rivets...........	19,000	Net area
Shear on bolts in clearance holes.	8,000	Gross section
Bearing on bolts in clearance holes	16,000	Gross section
Bolts or threaded portions of rods in tension	12,000	Net section
Compression	14,000—59 l/r	Gross area

l=unsupported length of member in inches.
r=least radius of gyration in inches.

For steels of greater strength, the allowable stresses may be increased in proportion to the increase of their ultimate strength over that of the steels specified above.

The members of frames shall be securely bolted, riveted or welded together in accordance with all the applicable requirements in Part VI.

Cast iron shall not be used for any member of car frame or platform, which is subject to tension or bending except for compensating cable anchorages, releasing carriers and guide-shoe stands.

When material other than steel is used for car frames or platforms, the allowable stresses shall not exceed 0.156 of the ultimate strength of the material.

Local reductions in section of a member in bending through bolt holes for the fastening of hoist-rope or compensating-rope hitches, auxiliary apparatus on the crosshead, or plank, sheave boxes, and the fastening of platform to plank, need not be considered. Holes in webs of crosshead for sheave pins shall be reinforced by means of a plate, at least as thick as the web, riveted or welded to it.

The deflection of the crosshead and the safety plank shall not exceed ⅛ inch in each 10 feet of span under static conditions with contract load substantially uniformly distributed over the car platform.

The slenderness ratio l/r for members not normally subject to compression shall not exceed 250; for members normally subject to compression this ratio shall not exceed 120.

When car-leveling devices are used the car platform shall be provided with a substantial vertical face flush with its outer edge, extending a sufficient distance below the car floor so that there shall be no horizontal opening into the hoistway while the car is within the landing zone and the hoistway door is wholly or partially open.

Electric sidewalk elevators shall be provided with either flat metal tops or arched bows of sufficient strength to open the hatch cover.

Guide shoes for electric sidewalk elevators shall be at least 24 inches long unless two sets of shoes are used spaced 18 inches between centers.

If vertical lift covers are used on electric sidewalk elevators, the spacing of guide shoes or the length of a single guide shoe remaining on the guide rail when the car platform is level with the sidewalk, shall be at least one-third of the height of the hatch-cover stanchions.

If single guide shoes not less than 24 inches long are used, 6 inches of the shoe may be off the rails when the platform is level with the top landing.

If there is a railroad track on the elevator car, the tops of the rails shall be flush with the car floor.

Elevator cars shall be lighted at all times when in use to an intensity of at least one foot-candle at the threshold.

No glass shall be used in elevator cars except to cover certificates, lighting fixtures, and appliances necessary for the operation of the car, and as a vision panel in the car.

No piece of glass, unless laminated or otherwise made shatter-proof, shall exceed one square foot in area, and the total area of glass used in connection with lighting fixtures shall not exceed 4 square feet.

When two single elevators are installed in a single hoistway, both elevators shall be equipped with all the safeguards required by this Code for a single elevator, both with relation to each other and to top and bottom terminals.

Cars for electric freight elevators shall be enclosed at the sides, except at the openings necessary for loading and unloading, to a height of at least 6 feet, with solid (not openwork) metal enclosure, or to the crosshead if the crosshead is lower. The section of the car enclosure opposite the counterweight shall be extended to the crosshead or car top and may be of open work which will reject a ball 2 inches in diameter.

No part of an electric-freight-elevator-car enclosure shall deflect so as to reduce the actual running clearance below the amount specified in Paragraph 9131 or to exceed one-half inch when subjected to a force of 75 pounds applied horizontally at any point. The car enclosure shall be secured to the car floor and sling in such a manner so that it cannot work loose or become displaced in ordinary service.

Electric freight-elevator-car enclosures shall be of metal fastened to a substantial metal frame properly reinforced and braced so as to comply with this Paragraph, and shall be at lease equal to No. 14 U. S. Gauge (0.078 inch) sheet steel in strength and stiffness.

Electric freight-elevator-cars shall be equipped with solid or perforated metal top covers or wire grille work made of wire not less than No. 10 Steel Wire Gauge (0.135 inch diameter) or its equivalent. The openings in perforated metal and wire grille work shall be of such size that they will not pass a ball larger than one inch in diameter. Cast iron shall not be used for elevator tops. The top or cover shall be sufficiently strong to sustain a load of 150 pounds applied at any point. Where freight elevator platforms are 12 feet long or over, top covers may be omitted on the ends thereof where there are no hoistway openings above the lowest landing or where hoistway openings are protected by automatically closing doors or gates extending down to the floor.

Where no car gate is provided, the front section of the elevator car top shall be hinged along the line approximately 18 inches from the front of the car.

Where a freight-elevator car is entirely enclosed except the sides used for loading and unloading, and the top is not provided with a hinged section, an emergency exit shall be provided in the top as specified in Paragraph 9124.

A car door or gate shall be provided at each entrance to electric freight-elevator cars, except elevators which can be operated from the car only and are used to handle hand trucks of over 2000-pound capacity, motor vehicles, or motor trucks. Such door or gate when closed shall guard the full opening, except that it need not be more than 6 feet high. Each door or gate shall be provided with car-door or gate electric contacts complying with Paragraph 9124 or with interlocks meeting the requirements of Paragraph 9112.

A weight used to automatically close a car door or gate shall run in metal guides from which it cannot become dislodged, or it shall be boxed in. The bottoms of the guides or boxes shall be so constructed as to retain the weight if the rope breaks.

Car and Counterweight Safeties and Speed Governors for Electric Freight Elevators

Par. 9135. Freight-elevator cars suspended by cables shall be provided with a safety or safeties attached to the car frame, one of which shall be located beneath the car platfrom, capable of stopping and sustaining the car with contract load.

The application of the safety shall not cause the car platform to become out of level in excess of one-half inch per foot, measured in any direction.

Car safeties shall be operated by speed governors. When the car safety is applied no decrease in the tension of the governor cable, or any motion of the car in the descending direction, shall release the car safety.

Jaws and other parts of safeties of the sliding type, if made of forged steel of an ultimate strength of not less than 55,000 pounds per square inch or cast steel of an ultimate strength of not less than 65,000 pounds per square inch, shall, in action, not be stressed beyond 17,000 pounds per square inch for tension, flexure, or compression.

Bearings for drum and screw-shafts shall be of non-ferrous material.

The car speed governor shall be set to cause the application of the safety at a speed not more than 40 per cent and not less than 15 per cent above the contract speed, except that governors shall not be required to trip at speeds less than 175 feet per minute. For a contract speed exceeding 500 feet and not exceeding 700 feet per minute, the governor tripping speed shall be not more than 33-1/3 per cent above the contract speed, and for contract speed exceeding 700 feet per minute, not more than 25 per cent above the contract speed.

Car and counterweight safeties for electric freight elevators shall be of the following types:

Type I Instantaneous.

Type W. C. Wedge Clamp—produces a constant retarding force.

Type G. W. C. Gradual Wedge Clamp—produces a gradually increasing retarding force.

Type F. G. C. Flexible Guide Clamp—produces a constant retarding force.

Each safety shall be marked for identification, the letters preferably cast on the safety jaws.

The distance between the safety jaws shall be not less than the thickness of the guide rail plus 3/32 inch, and the jaws shall not drag against the rail.

Safeties shall be marked by the manufacturer with the range of weight and speed for which they are designed; said weight to include the complete car structure, the safety, the contract load in the car, and all moving equipment the weight of which is born by the safety.

A safety of the instantaneous type shall not be used on elevator cars having a contract speed in excess of 100 feet per minute, or an up-speed, with the contract load, in excess of 110 feet per minute.

No car safety shall be permitted for stopping an ascending car, except above the upper terminal landing provided the retardation of the ascending car does not exceed 32.2 feet per second per second. If an ascending car is to be stopped on account of overspeed, a safety shall be applied to the counterweight or the governor may be arranged to open the motor circuit and apply the brake.

The governor shall be located where it cannot be struck by the car in case of overtravel, and where there is sufficient space for full movement of the governor parts.

The motor-control circuit and the brake-control circuit shall be opened before or at the time the governor trips.

The governor cable shall be of iron, steel, monel metal, or phosphor bronze, not less than three-eights inch in diameter. Tiller-rope construction shall not be used for governor cables, except for that portion of the cable which is wound on the safety drum. Such portion shall be of corrosion-resistant metal.

Governor ropes shall run clear of governor jaws during the normal operation of the elevator.

The size, material and construction of the governor rope, together with the proper tripping speed of the governor, shall be stamped on the governor stand, or given on a brass plate attached to it, in letters not less than one-quarter inch in height.

The arc of contact between the governor rope and the driving sheave shall, in conjunction with a tension device, provide sufficient traction to cause proper operation of the governor.

The minimum length of governor jaws shall be such that no serious cutting, tearing, or deformation of the rope shall result from the operation of the safety.

Elevators having winding-drum machines shall be provided with a slack-cable device which will cut off the power and stop the elevator machine if the car is obstructed in its descent. Slack-cable switches shall be so constructed that they will not automatically reset when the slack in the cable is removed.

No car safety which depends on the completion or maintenance of an electric circuit for the application of the safety shall be used. Car safeties shall be applied mechanically.

The gripping surfaces of car or counterweight safeties shall not be used to guide the car or counterweights.

A pawl and ratchet shall not be considered a sufficient safety device.

The counterweight safety, if provided, shall be permitted to be operated by the same governor and governor rope that is used to operate the car safety. Provision shall be made to cause the application of the counterweight safety at a speed greater than that at which the car safety is applied, but at not more than 10 per cent above that speed. Broken-rope safeties of the instantaneous type shall not be used on counterweights if the speeds and corresponding weights are greater than shown in Table 9135T.

TABLE 9135T

Contract Speed in feet per minute	Total Weight of Counterweight in Pounds
250	2000
200	3000
160	4000
125	5000

Reversing the direction of motion of the elevator machine shall be permitted to release the safeties.

Machines, Machine Safeties and Terminal Stopping Devices for Electric Freight Elevators

Par. 9136. Drums and leading sheaves of electric freight elevators shall be of cast iron or steel, and shall have finished grooves. "U-grooves" shall be not more than one-sixteenth inch larger than the cables.

The diameters of sheaves and drums for hoisting and counterweight cables shall be not less than 40 times the diameter of the cable, except for sidewalk elevators.

Openings in drums shall be drilled at an angle of not over 45 degrees with the run of the cable and provided with a rounded corner with a radius at least equal to that of the cable.

The factor of safety, based on static loads, to be used in the design of elevator hoisting machines shall be not less than:

8 for wrought iron or wrought steel.
10 for cast iron, cast steel or other materials.

Set-screw fastenings shall not be used in lieu of keys or pins when the fastening is subject to torque or bending.

Friction-type gearing or clutch mechanism shall not be used for fastening the drums or sheaves to the main driving gear.

Worm gearing having cast-iron teeth shall not be used.

Winding-drum and traction machines for electric freight elevators shall be equipped with brakes applied automatically by springs or gravity when the operating device is at the "stop" position. Electric elevator machines shall be equipped with electrically released brakes.

Brakes shall not be released until power has been applied to the motor.

A single ground, short-circuit, or counter-voltage shall not prevent the action of the brake magnet from allowing the brake to set in the intended manner during normal operation.

A motor-field discharge, counter-voltage, single ground, or accidental short-circuit shall not retard the action of the brake magnet in allowing the brake to set during emergency stops.

Electric freight elevators shall be provided with upper and lower normal terminal stopping devices, arranged to automatically stop the car from any speed attained in normal operation within the top and bottom overtravel independently of the operating device, the final terminal stopping device and the buffers.

Normal terminal stopping devices shall be as follows:

For winding-drum machines; stopping switches installed on the car or in the hoistway operated by the movement of the car.

For traction machines; stopping switches installed on the car, or in the machine room, or in the hoistway operated by the movement of the car.

If located in the machine room, the stopping contacts shall be mounted on and operated by stopping devices mechanically connected to the car, with no dependence on friction as a driving means. An automatic safety switch shall be provided which will stop the machine should the tape, chain, rope or other similar device, mechanically connecting the stopping device to the car, fail.

In the case of elevators using floor controllers or other similar devices, for automatic stopping at floor landings, only one set of floor-stop contacts is necessary for each terminal landing, provided these contacts and the means for operating them comply with the requirements for terminal stopping devices. These contacts then serve also as normal terminal stopping devices.

Electric sidewalk elevators having winding drum machines and either automatic or continuous pressure operation shall have a stopping device on the machine and in the hoistway. These stopping devices shall not control the same switches unless two or more separate and independent switches are provided, two of which shall be closed to complete the motor and brake circuit in each direction of travel.

Electric freight elevators except sidewalk elevators shall be provided with upper and lower final terminal stopping devices arranged to automatically stop the car and counterweight from contract speed within the top clearance and bottom overtravel independently of the operation of the normal terminal stopping devices and the operating device, but with buffers operative.

Final-limit switches shall be set to operate with the car as close to the terminal landing as practical without interfering with the normal operation of the elevator, except that where means are provided to prevent jumping of the car or counterweight, they may be set to open before the buffer is fully compressed. Where spring buffers are provided, the final-limit switches shall be set to open before the buffer is engaged.

Final terminal stopping devices shall be as follows:

For winding-drum machines; stopping switches installed on the machines and also in the hoistway operated by the movement of the car.

For traction machines; stopping switches installed in the hoistway operated by the movement of the car.

The final terminal stopping devices shall act to prevent movement of the car in either direction of travel. The normal and final terminal stopping devices shall not control the same switches on the controller unless two or more separate and independent switches are provided, two of which shall be closed to complete the motor and brake circuit in each direction of travel. When two-phase or three-phase alternating current is used to operate the elevator the above switches shall be of the multiple type.

When the final terminal stopping device controls the same controller switch or switches as those controlled by the operating device or the normal terminal stopping device, it shall be connected into the control circuit on the opposite side of the line.

Chain-, rope-, or belt-driven-machine terminal stopping devices shall not be used on electric freight elevators having winding drums.

Elevators having winding-drum machines driven by two-phase or three-phase alternating-current motors, except elevator machines with the alternating-current motors and direct-current brakes and direct-current main-line or potential switches controlled by final terminal hoistway stopping switches, shall have a main-line circuit to the motor and brake directly opened either by contacts in the machine stop-motion switch or by hoistway limit switches operated by a cam attached to the car. The opening of these contacts shall take place before or coincident with the opening of the final terminal stopping device and shall prevent movement of the machine in either direction.

Normal and final terminal stopping switches, whether on the car or in the hoistway, shall be of the enclosed type.

Normal and final terminal stopping devices, whether on the car or in the hoistway, shall be securely mounted in such a manner that the movement of the switch lever or roller to open the contacts shall be as nearly as possible in a direction at right angles to a line drawn between the faces of the car guide rails.

The cam or cams for operating the normal and final terminal stopping switches shall be of metal and so located and of such length as to maintain the switch in the open position when the car is in contact with the overhead structure, or resting on the fully compressed buffer with the overhead structure and the buffer in their normal position.

The contacts of all terminal stopping devices shall be opened by direct mechanical means. Arrangements in which a spring or gravity opens the contacts on withdrawal of a cam, lug or similar member are prohibited.

Cables and Cable Equalizers for Electric Freight Elevators

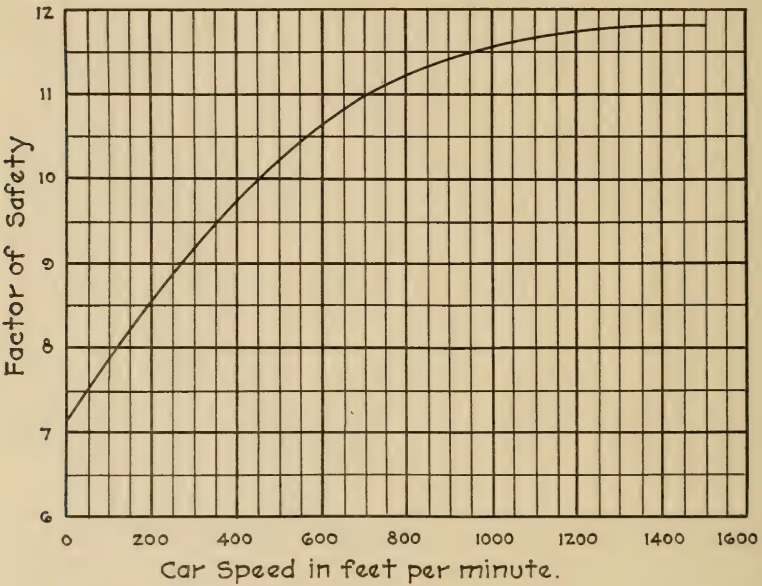
Par. 9137. Car and counterweight cables for electric freight elevators shall be of iron or steel without covering, except that where liability to excessive corrosion or other hazard exits, marline-covered cables are permitted. Chains for hoisting the car may be used only on sidewalk elevators.

The number of cables, their diameter in inches and their ultimate strength in pounds shall be placed on the metal plate required in Paragraph 9132 and on a metal tag attached to the cable fastenings. The kind of material in the cables, the date of installation of the cables and the fact that they are preformed, if such is the case, shall also be placed on the tag.

Where the rated ultimate strength and material of the cables are not known, the allowable loads shall be limited to the loads allowed for iron cables of the same diameter.

The factor of safety, based on static loads, for car and counterweight cables for electric freight elevators shall be not less than the value given in Diagram 9137D, corresponding to the contract speed of the car.

DIAGRAM 9137D



Hoisting cables less than one-half inch in diameter shall not be used for electric freight elevators.

The minimum number of hoisting cables used with traction elevators shall be three and for winding-drum elevators, two for the car and two for each counterweight.

Cable equalizers and their fastenings, except equalizers of the single swingle-tree type used with drum-type machines and equalizers of the individual-compression-spring type capable of being fully compressed without failure, shall be approved by the Buildings Engineer on the basis of tests made by an approved testing laboratory. Such tests shall show the ultimate strength of the component parts and of the assembly of the equalizer and its fastenings. No equalizer shall be used unless such ultimate strength is at least 10 per cent in excess of the ultimate strength of the cables.

All cables anchored to a winding drum shall have not less than one turn of cable on the winding drum when the car or counterweight has reached the extreme limit of its overtravel.

Car or counterweight cables shall not be lengthened or repaired by splicing.

The winding-drum ends of car or counterweight cables shall be secured by clamps on the inside of the drums or by one of the methods specified in Paragraph 9127 for fastening cables to cars or counterweights.

The car and counterweight ends of cables shall be fastened either by return loops or by individual tapered babbitted sockets, both made in accordance with the requirements for electric passenger elevators in Paragraph 9127.

If socketed cable fastenings are used, adjustable shackle rods shall be provided to attach cables to cars and counterweights in such a manner that all portions of the cable not in the socket shall be readily visible.

Controls for Electric Freight Elevators

Par. 9138. Electric freight elevators shall not be operated by a hand-operated rope, cable or rod, or by a wheel or lever mechanism.

The handle of car-switch operating devices shall be arranged to return to the "stop" position and lock there automatically when the hand of the operator is removed from the handle.

If more than one operating device is used in a car, except in automatic-operation elevators, the operating devices shall be so interlocked that only one can be used at a time. If a single operating device is used, it shall be so located as to be near the car opening serving the greatest number of landing openings.

An emergency stop switch or button which will cut off the power shall be provided in the car adjacent to the operating device for all electric elevators. A self-restoring type of switch or button may be used as an emergency stop switch only with automatic operation. Where a self-restoring switch or button is used, and the car has been started from within the car, releasing the switch or button shall not permit restarting the car, except by the operating device in the car unless the car gate or hoistway landing door has been opened and closed. Switches and buttons shall be plainly marked "Stop" and the operating button or handle shall be of a different color from that of any other switch or handle in the car. Contacts of emergency stop switches or buttons shall be opened by direct mechanical means and shall not be dependent upon springs for the opening of the contacts.

Where a winding drum machine is used, the traveling cable wires leading to the emergency stop switch shall be arranged and connected so that a short circuit between the wires in any traveling cable will not result in a short circuit of the emergency stop switch.

Where metal-to-metal contacts, either gravity or spring opened, or a combination of the two, are used on controller switches for stopping an elevator machine, at least two independent breaks shall be provided.

The operation of a spring or springs in tension, or the completion of another electric circuit, shall not be depended upon to break the circuit to stop an automatic-operation elevator at the terminals.

No control system shall be used which depends on the completion or maintenance of an electric circuit for the interruption of the power and the application of electromechanical brakes at the terminals, for the operation of safeties, or for the closing of a contactor by an emergency stop button. This regulation shall not be interpreted to apply to dynamic-breaking or to speed-control devices.

Car-switches shall be so arranged that the movement of the handle toward the opening which the operator usually faces will cause the car to descend and the movement of the handle away from the opening will cause the car to ascend.

Continuous-pressure operation shall not be used for freight elevators unless they are provided with all of the safety devices required for automatic operation.

When an overload circuit-breaker is used for a direct current electric elevator, the wiring shall be arranged so that the circuit of the brake-magnet coil is opened at the same time that the line circuit is opened.

Automatic-operation electric freight elevators shall conform to the following requirements:

If the car has started for a given-landing it shall be impossible to give an impulse from any landing to send the car in the reverse direction until the car has reached the destination corresponding to the first impulse. This, however, shall not prevent stopping the car at any intermediate landing to take on or discharge attendants or freight going in the original direction.

If the car has been stopped to take on or discharge attendants or freight and is to continue in the direction determined by the first impulse, it is permissible to start the car by the closing of the car gate.

It shall be impossible to start the car under normal operation unless every hoistway door is closed and locked in the closed position.

An inspector's switch shall be installed on the controller to render all landing buttons inoperative. If the opening of the emergency stop switch or button does not cancel all registered car and landing calls, the inspector's switch shall also render all car buttons inoperative, and in addition, there shall be furnished in the car an "Up" and "Down" inspection switch or button which will enable the inspector to operate the elevator in either direction as long as the switch or button is held in contact.

They shall be provided with an audible emergency signal that is operative from the car and located outside of the hoistway or with a telephone. Unless the telephone is permanently connected to a central exchange, the telephone signal or the emergency signal shall be clearly audible at all times to some person who is continuously on duty while the elevator is in service.

The hoistway of every electric freight elevator, except automatic-operation and continuous-pressure elevators, shall be provided with a signal system by means of which signals can be given from any landing whenever the elevator is desired at that landing.

Special speed-control or retarding devices installed in connection with reduced-stroke buffers shall meet the requirements of Paragraph 9123.

Provisions shall be made to render the car operative, independent of the position of the hoistway doors, in case of fire, panic or other similar emergency by means of an emergency release, except that elevators which can be started from a landing shall not be provided with emergency release unless equipped with a car switch for dual operation, in which case an emergency release shall be installed but so arranged that when the elevator is operated without an operator in the car the emergency release shall be inoperative.

The emergency release shall be in the car, plainly visible to the occupants of the car and easily accessible to the operator.

The emergency release shall be provided with a break-glass cover and means for breaking the glass.

To operate the car under emergency conditions, it shall be necessary for the operator to break the glass and hold the emergency release in the operative position.

The emergency release shall be constructed so that it cannot readily be tampered with or plugged in the release position. Rods, connections and wiring used in the operation of the emergency release, that are accessible from the car, shall be enclosed and protected from injury. Broken glass covers shall be replaced before the car is again placed in regular service after the emergency.

Tests for Electric Freight Elevators

Par. 9139. Every electric freight elevator before being placed in regular service shall be subjected to a contract-load test and a car and counterweight safety test made under the supervision of the Buildings Engineer, in accordance with the applicable requirements in Paragraph 9129 for electric passenger elevators. Approval of any such elevator shall be granted only upon satisfactory completion of such tests.

SECTION 914

HYDRAULIC ELEVATORS

General Requirements for Hydraulic Elevators

Par. 9140. Hydraulic elevators, except automatic-operation elevators and elevators controlled by a regular operator, shall have a maximum contract speed of 100 feet per minute.

Clearances for Hydraulic Elevators

Par. 9141. The top clearance and the top and bottom overtravel and the depth of the pit for plunger-type hydraulic elevators shall be not less than that given in the following table:

TABLE 9141T

Car Speed in Feet per Minute	Top of Shaft		Bottom of Shaft	
	Overtravel in Feet	Clearance in Feet	Overtravel in Feet	Depth of Pit in Feet
0 to 50	2.5	4.5	1.0	4.0
51 to 150	3.0	5.0	1.5	4.5
151 to 300	5.0	7.0	2.5	5.5
301 to 500	7.0	9.0	3.5	6.5

The horizontal clearances for hydraulic plunger elevators and all the clearances for rope-geared hydraulic elevators shall meet the requirements for electric passenger elevators in Paragraph 9121.

Capacity and Loading for Hydraulic Elevators

Par. 9142. The capacity and loading for hydraulic passenger elevators shall meet the requirements of Paragraph 9122. The capacity and loading for hydraulic freight elevators shall meet the requirements of Paragraph 9132.

Guides, Buffers and Counterweights for Hydraulic Elevators

Par. 9143. Guides, buffers and counterweights for hydraulic elevators shall meet the requirements of Paragraph 9123 when used for passenger service and of Paragraph 9133 when used for freight service, except that for plunger elevators, the bumper or buffers shall stop the fully loaded car at the maximum operating speed.

Car Construction for Hydraulic Elevators

Par. 9144. Cars for hydraulic elevators shall be constructed in accordance with Paragraph 9124 when used for passenger service, and in accordance with Paragraph 9134 when used for freight service, except that for car doors or gates of elevators with control valves not electrically operated, equivalent mechanical protection may be provided in lieu of electric contacts.

Car and Counterweight Safeties and Speed Governors for Hydraulic Elevators

Par. 9145. Car and counterweight safeties and speed governors for hydraulic elevators shall meet the applicable requirements of Paragraph 9125.

Machines and Machine Safeties for Hydraulic Elevators

Par. 9146. Hydraulic elevators shall be provided with upper and lower normal terminal stopping devices, arranged to automatically stop the car, from any speed attained in normal operation, within the top and bottom overtravel independently of the operating device, the final terminal stopping device and the buffer, except where handrope- or rod-operating devices are used, the terminal stopping device may operate in conjunction with the operating device.

Normal terminal stopping devices shall be installed as follows:

> Hydraulic elevators having a contract speed in excess of 100 feet per minute shall have an automatic stop valve independent of the normal control valve or valves, operated either by the car or the machine.

Hydraulic elevators having a contract speed of 100 feet per minute or less and handrope-or rod-operating devices shall have stop balls on the operating devices.

Plunger hydro-electric elevators having a car speed of 100 feet per minute or less and automatic or double-button operation shall have hoistway limit switches which will automatically stop the car at the upper and lower terminal landings.

Hydraulic-elevator machines, whether of the vertical or horizontal type, shall be so constructed and so roped that the piston will be stopped before the car can be drawn into the overhead work. Stops of ample strength shall be provided to bring the piston to rest when under full pressure without causing damage to the cylinder or cylinder head.

The traveling sheaves for vertical hydraulic elevators shall run in guides. The guide rails and guide shoes shall be of metal.

The side frames of traveling sheaves for vertical hydraulic elevators shall be either of rolled or forged steel.

The construction, commonly known as the "U-strap connection", shall not be used between the piston rods and the traveling sheaves.

Where more than one piston rod is used on the vertical pulling type, an equalizing crosshead shall be provided for attaching the rods to the traveling-sheave frame to insure an equal distribution of load on each rod.

Equalizing or cup washers shall be used under the piston-rod nuts to insure a true bearing.

Cylinders of hydraulic-elevator machines shall be provided with means for releasing air or other gas.

Piston rods of tension-type hydraulic elevators shall have a factor of safety of not less than 8, based on the cross-sectional area at the root of the thread. A true bearing shall be maintained under the nuts at both ends of the piston rod to prevent eccentric loading on the rods.

The outlet of pressure tanks shall be so located as to prevent the entrance of air or other gas into the elevator cylinder.

Automatic stop valves for elevators shall be packed with cup leathers, or other means shall be used to prevent sticking of the valve stems.

Each pump connected to the pressure tank of a hydraulic passenger elevator shall be equipped with a relief valve, so installed that it cannot be shut off. The relief valve shall be of sufficient size and so set as to pass the full capacity of the pump at full speed without exceeding the safe working pressure of the pump or tank. The relief valve shall be piped to discharge into the discharge tank or the pump suction. Two or more relief valves may be used to obtain the necessary capacity.

Elevator pumps, unless equipped with pressure regulators which control the motive power, shall be equipped with automatic by-passes.

Pressure tanks shall be made and tested in accordance with the requirements for unfired pressure vessels, Chapter 93.

Each pressure tank shall be provided with a water-gauge glass, having brass fittings and valves, attached directly to the tank and so located as to show the level of the water when the tank is more than half-full.

Each pressure tank shall have a pressure gauge which correctly indicates pressure to at least one and one-half times the normal working pressure allowed in the tank. This gauge shall be connected to the tank by a brass or other non-corrodible pipe in such a manner that the gauge cannot be shut off from the tank except by a cock with a "T" or lever handle. The "T" or lever shall be set in line with the direction of the flow. The cock shall be in the pipe near the gauge.

The tank shall be provided with a one-quarter inch pipe-size valved connection for attaching an inspector's gauge while the tank is in service.

Pressure tanks that may be subjected to a vacuum shall be provided with one or more vacuum relief valves with openings of sufficient size to prevent the collapse of the tank if a vacuum occurs.

Pressure tanks shall be so located and supported that inspection may be made of the entire exterior.

Discharge tanks open to the atmosphere shall be so designed that when completely filled the factor of safety shall be not less than 4. Discharge tanks shall be covered to prevent the entrance of foreign material, and provided with a suitable vent to the atmosphere.

Hydraulic elevators operated from a pressure tank where the fluid pressure is obtained by directly admitting steam, air or other gas to the tank, shall comply with all the rules covering hydraulic elevators.

In the design of plunger elevators, adequate provision shall be made to stop the plunger as well as the car.

Cables and Cable Equalizers for Hydraulic Elevators

Par. 9147. Cables and cable equalizers for hydraulic passenger elevators shall meet the requirements of Paragraph 9127 and those for hydraulic freight elevators shall meet the requirements of Paragraph 9137.

Controls for Hydraulic Elevators

Par. 9148. Hydraulic elevators having a contract speed in excess of 100 feet per minute shall not be operated by direct hand-operated ropes, cables or rods, or by push buttons.

Hydraulic elevators operated by a wheel operating device shall be provided with an indicating device in the car to show the position of the control valve. Such device shall be marked and shall indicate "UP", "DOWN" and "OFF". The wheel operating device shall be marked to indicate direction of motion.

On mechanical- or automatic-operation elevators, the operation of directional switches or operating valves shall not depend solely upon belts or upon cast- or malleable-iron chains. If a handrope is used, the cable shall be securely anchored to the operating sheave or drum.

Hydraulic freight elevators, operated by means of a direct-operated handrope shall be provided with a centering device which will insure the operating mechanism being placed in the stop position when it is desired to stop the car, and shall be equipped with hand-rope locks for locking the operating ropes in the "OFF" position when the car is at any landing.

In other respects the operation and control of hydraulic elevators shall be in accordance with Paragraphs 9128 and 9138 for passenger and freight elevators respectively.

Tests for Hydraulic Elevators

Par. 9149. Every hydraulic elevator before being placed in regular service shall be subjected to a contract-load test and a car and counterweight safety test made under the supervision of the Buildings Engineer, in accordance with the applicable requirements in Paragraph 9129 for electric passenger elevators. Approval of any such elevator shall be granted only upon satisfactory completion of such tests.

SECTION 915

HAND AND GRAVITY ELEVATORS

General Requirements for Hand and Gravity Elevators

Par. 9150. Hand and gravity elevators shall not have a car travel in excess of 4 stories or 40 feet.

Hand and gravity elevators having a travel of more than 2 stories or 20 feet shall be equipped with a centrifugal speed governor which will control the speed of the car in its descent.

No person shall be permitted to ride on a hand or gravity elevator and signs to that effect shall be posted at every landing of each such elevator.

A hand or gravity elevator car shall not be arranged to counterbalance another if persons are permitted to step on them for the purpose of loading or unloading, unless hoistway gates or doors are provided which are equipped with interlocks.

Pull ropes shall be so installed that the elevator cannot be operated from the car, but only from the landings, without reaching through or over the landing doors or gates.

Clearance for Hand and Gravity Elevators

Par. 9151. A top overtravel of not less than 18 inches and a top and bottom clearance of at least 2 feet shall be provided for all hand and gravity elevators. No overtravel is required at the bottom.

Horizontal clearances for hand and gravity elevators shall be not less than those required in Paragraph 9121 for power passenger elevators.

Capacity and Loading for Hand and Grartiy Elevators

Par. 9152. The contract load of hand and gravity elevators shall be not less than 50 pounds per square foot of platform area inside of the car enclosure.

A metal plate showing the contract load of the elevator, in pounds, in letters or figures not less than one-fourth inch high and stamped, etched, or raised on the surface of the plate, shall be fastened in a conspicuous place in the elevator car.

A similar metal plate bearing the suspension data required in Paragraph 9157 shall be placed upon the crosshead.

Counterweights, Guides and Buffers for Hand and Gravity Elevators

Par. 9153. The cars and counterweights of hand and gravity elevators shall run in guides. Sections of counterweights, whether carried in frames or not, shall be secured by at least two tie rods passing through holes in the sections. The tie rods shall have lock nuts at each end secured by cotter pins.

Car and counterweight guide rails shall be of steel or straight-grained, seasoned wood free from knots, shakes, dry rot, or other imperfections. Guide rails shall be securely fastened with through bolts or clips of such strength, design, and spacing that the guide rails and their fastenings shall not deflect more than one-fourth inch under normal operation particularly where they are in contact with the guide shoe when the car is at the landing. Guide rails shall withstand the application of the safety when stopping a fully loaded car or a counterweight. The guiding surfaces of the guide rails for elevators requiring safeties shall be finished smooth. The guide rails shall be bottomed on suitable supports and extended at the top to prevent guide shoes running off in case the overtravel is exceeded.

Car buffers of the spring type or their equivalent shall be installed in the pits of hand and gravity elevators.

Buffers shall be located symmetrically with reference to the center of the car.

Car Construction for Hand and Gravity Elevators

Par. 9154. Car frames and platforms shall be of metal or sound seasoned wood designed with a factor of safety of not less than 4 for metal or 6 for wood, based on the uniformly distributed contract load.

Hand and gravity elevators operating outside a building, except sidewalk elevators, shall have cars enclosed on the top and the sides not used for an entrance. The enclosure shall not deflect more than one-fourth inch if subjected to a force of 75 pounds applied perpendicularly to the car enclosure at any point. The car enclosure shall be secured to the car platform or frame in such a manner that it cannot work loose or become displaced in ordinary service.

Elevator cars operating in hoistways outside the building which are enclosed only at the ground landing shall be protected on the entrance side or sides either by independently operated gates or bars interlocked with the car operating mechanism, or by semi-automatic gates or bars.

Car and Counterweight Safeties for Hand and Gravity Elevators

Par. 9155. Hand and gravity elevators suspended by cables, chains, or ropes and having a travel of more than 15 feet shall be provided with a safety attached to the under side of the car frame capable of stopping and sustaining the car and contract load. Such safety device shall meet the requirements of Paragraph 9125, except that it is not required that car safeties shall be operated by speed governors.

If a hand or gravity elevator whose travel exceeds 15 feet will accelerate to a speed in excess of 50 feet per minute within the limits of travel with the brake released, the brake shall be automatically applied in case of failure of the hand rope.

Machines and Suspension Members for Hand and Gravity Elevators

Par. 9156. Hand and gravtity elevators shall be equipped with a hand brake that operates in either direction of motion of the elevator. When the brake has been applied it shall remain locked in the on position until released.

The factors of safety based on the static loads to be used in the design of all parts of hoisting machines shall be not less than 8 for wrought iron or rolled steel and 10 for cast iron and other materials.

No hand-elevator machine shall be equipped with any means or attachment for applying any other power unless such elevator is permanently and completely converted into a power elevator complying with requirements of this Code for power elevators.

Cables, Ropes and Chains for Hand and Gravity Elevators

Par. 9157. The metal plate required in Paragraph 9152 to be placed on the crosshead shall show the number, size, rated ultimate strength and the material of the suspension for hand and gravity elevators.

In addition, a metal tag showing the size, rated ultimate strength, and material of the suspension and the date of its installation shall be attached to the suspension fastenings.

The factor of safety used in determining the size of the suspension member shall be 5, based on the weight of the car and its contract load.

Suspension members shall be so adjusted that either the car shall rest upon its buffers or the counterweight upon the floor of the pit before the counterweight or the car respectively strikes any part of the overhead structure.

Suspension members secured to a winding drum shall have not less than one complete turn of the suspension member around the winding drum when the car or counterweight has reached the extreme limit of its overtravel.

The drum end of cables shall be secured by clamps inside the drum.

Tests for Hand and Gravity Elevators

Par. 9159. A contract-load test of every hand or gravity elevator shall be made under the supervision of the Buildings Engineer before any such elevator is placed in regular service. It shall include a test of any automatic brakes or special retarding devices where they are required by this Code.

Approval of any such elevator shall be granted only upon satisfactory completion of such test.

SECTION 916

ESCALATORS

General Requirements for Escalators

Par. 9160. The angle of inclination of an escalator shall be not in excess of 30 degrees from the horizontal.

The speed of an escalator measured along the incline shall not exceed 125 feet per minute, except that if the line of entrance and exit is not in the vertical plane of travel, the speed shall not exceed 100 feet per minute.

There shall be a suitable light in every escalator machine room, which can be lighted without passing over or reaching over any part of the machinery.

Access to the interior of the escalator shall be provided for inspection and maintenance.

Width of Escalators

Par. 9161. The width of an escalator shall be measured between the balustrades at a vertical height of 24 inches above the nose line of the treads.

Escalators shall be not less than 24 inches nor more than 48 inches wide, and shall have a horizontal tread formation.

Capacity and Loading for Escalators

Par. 9162. The contract load for an escalator shall be computed by the following formula:

Contract Load = 4.6W A.

In this formula W is the width of the escalator is inches and A the horizontally projected length in feet of the exposed treads. The contract load is expressed in pounds.

Design of Escalators

Par. 9163. The factor of safety to be used in the design of escalator trusses or girders shall be not less than 5, based on the static loads.

The escalator truss or girder shall be so designed that it will safely retain the steps and running gear if the track system fails to retain the running gear in its guides.

The track arrangements shall be designed to prevent the displacement of the treads and running gear if a tread chain breaks.

Balustrades for Escalators

Par. 9164. Escalators shall be provided on each side with solid balustrades. On the escalator side, the balustrades shall be smooth, without depressed or raised paneling or molding. Glass panels in balustrades are prohibited.

There shall be no abrupt changes in the width between the balustrades on the two sides of the escalator. Should any change in the width be necessary, the change shall be not more than 8 per cent of the greatest width.

In changing from the greater to the smaller width the change in the direction of the balustrades shall be not more than 15 degrees from the line of the escalator travel.

Each balustrade shall be equipped with a handrail moving at the same speed and in the same direction as the travel of the escalator.

Treads and Landings for Escalators

Par. 9165. Escalator treads and landing shall be of material and design affording secure foothold, such as wood or material used for safety treads. If the landing is of concrete, it shall have edge insertions of metal, wood, or other anti-slip material.

Application of Power to Escalators

Par. 9166. Escalators shall be driven by individual electric motors.

All chains shall have a factor of safety of not less than 10, except where the chain is composed of cast-steel links, which shall be thoroughly annealed, in which case the factor of safety shall be not less than 20.

Safeties for Escalators

Par. 9167. An emergency stop button or other type of switch accessible to the public, shall be conspicuously located at the top landing and bottom landing of each escalator.

The operation of either one of these buttons or switches shall cause the interruption of power to the escalator.

It shall be impossible to start an escalator by means of these buttons or switches.

These buttons or switches shall be marked "ESCALATOR STOP BUTTON" or "ESCALATOR STOP SWITCH".

If starting buttons or switches are accessible to the public they shall be either of the key-operated type or be enclosed in a box provided with a lock and key.

Each escalator operating in the ascending direction shall be equipped with means to cause the interruption of power to the escalator in case of accidental reversal of travel.

Each escalator shall be provided with a speed governor which will cause the interruption of power to the escalator in case the speed exceeds a predetermined value which shall be not more than 40 per cent in excess of the normal running speed.

Each escalator shall be provided with a broken-chain device that will cause the interruption of power to the escalator in case a tread chain breaks.

Where an escalator is equipped with tightening devices operated by means of tension weights, provision shall be made to retain these weights in the escalator truss in case the weights should fall.

Each escalator shall be provided with an electrically released and mechanically applied safety brake, of sufficient power to stop the fully loaded escalator, mounted on the main drive shaft of the escalator.

This safety brake shall automatically stop the escalator from operating or tending to operate in the descending direction when any of the above safety devices function, except that where the escalator drive machine is equipped with an electrically released and mechanically applied brake, of sufficient power to stop the fully loaded escalator, the functioning of the above safety devices may apply this brake instead of the safety brake, if a device is furnished which will apply the safety brake in case the connection between the escalator drive machine and the main drive shaft parts.

Tests for Escalators

Par. 9169. Every escalator before being placed in service shall satisfactorily pass the following tests made under the supervision of the Buildings Engineer:

Speed Test: The application of the overspeed safety device shall be obtained by causing the escalator to travel at the governor tripping speed. With escalators driven by alternating-current motors, the governor may be tripped by hand with the escalator traveling at its normal rate of speed.

Reversal Test: The accidental-reversal device shall be made to function by manually operating or attempting to operate the escalator in the reverse direction.

Broken Chain: The application of the broken-chain safety device shall be obtained by operating the device by hand.

Stop Button: Test of the escalator emergency stop buttons or switches shall be made to determine whether they function properly.

Safety Brake: The device, required in some cases by Paragraph 9167, which applies the safety brake in case the connection between the escalator drive machine and the main drive shaft fails, shall be tested by operating the device by hand.

SECTION 917

CRANES, HOISTS AND CONVEYORS

General Requirements for Cranes, Hoists, Conveyors and Similar Equipment

Par. 9170. Cranes, hoists, conveyors and similar equipment include all the machinery, apparatus and equipment used for raising or lowering freight by means of a sling, hook or platform which does not run in fixed or permanent guides.

A notice shall be placed on every crane, hoist, conveyor or similar equipment showing the maximum allowable load. This notice shall be clearly legible from the floor.

An unobstructed passageway not less than 3 feet wide shall be maintained parallel to and extending the entire length of the tracks upon which any gantry crane is operated.

An unobstructed aisle not less than 3 feet wide shall be maintained for floor operated cranes.

No person shall be permitted to ride on cranes, hoists and conveyors, except when special facilities are provided to accommodate an operator.

Design of Cranes, Hoists and Conveyors

Par. 9171. All cranes, hoists and conveyors shall be designed throughout with not less than the following factors of safety, based on the static load:

Material	Factor of Safety
Cast iron	12
Cast steel	8
Structural steel	5
Forged steel	5
Cables	5

Calculations for wind pressure on outside cranes and hoists shall be based on not less than 30 pounds per square foot of exposed surfaces.

Construction of Cranes, Hoists and Conveyors

Par. 9172. The construction of cranes and hoists shall be such that all moving parts may be safely lubricated and inspected when cranes and hoists are not in operation. Cast iron shall not be used in parts subject to tension except in drums, trolley sides, bearing brackets and brake shoes.

Bolts subject to stress shall be through bolts and all bolts shall be equipped with approved protection so that the bolts will not work loose nor the nut work off.

Outside crane cages shall be enclosed. There shall be windows on three sides of the cage and the windows in the front and the side opposite the door shall be the full width of the cage.

Tool boxes or receptacles, used for the storing of oil cans and tools, shall be permanently secured in the cage or on the foot walk. Tool boxes of hot metal cranes shall be constructed of metal.

A braking apparatus shall be provided on every type of crane and hoist, so designed and installed as to be capable of effectively braking a weight of at least one and one-half times the full rated load.

Foot brakes or other effective means shall be provided to control the bridge travel of all overhead traveling cranes.

A headlight and taillight shall be provided on all traveling cranes when used at night, except in lighted buildings or flood-lighted yards.

Electrical equipment for cranes, derricks, hoists, conveyors and similar equipment shall meet the requirements of Part VIII, especially Section 846.

Rail Stops, Bumpers and Fenders for Cranes

Par. 9173. Rail stops shall be provided at both ends of crane runways and at the ends of crane bridges. When two cranes are operated on the same runway or two trolleys are operated on the same bridge rails, bumpers shall be provided to prevent collision of the cranes or trolleys.

Bumpers and rail stops shall extend at least as high as the centers of the wheels.

Unless the rails are securely fastened to the girders, the rail stops shall be fastened to the girders and rails. This does not apply to portable rail stops.

Fenders shall be installed which extend below the lowest point of the treads of the outside truck wheels. They shall be of a shape and form that will tend to push or raise a man's hand, arm or leg off the rail and away from the wheels.

Cables and Chains for Cranes and Hoists

Par. 9176. Cables of cranes and hoists shall be immediately removed when the number of broken wires has reduced the design factor of safety by more than 15 per cent.

There shall be not less than two full laps of hoisting cable on the drums of cranes and hoists at all times.

Bottom sheaves shall be protected by close fitting guards to prevent the cable from becoming displaced.

Where the cables are allowed to pile on the drums of cranes, the drums shall have a flange at each end to prevent the cables from slipping off the drum.

Chains shall meet the "Standard Specification for Chains" of the American Society for Testing Materials, Serial Designation A56-39.

Chains which have stretched more than one-third the length of a link for any three-foot length of the chain shall be discarded.

Bolts or nails shall not be placed between any two links.

Chains shall not be spliced by inserting a bolt between two links or by passing one link through another and inserting a bolt or nail.

Safeties for Cranes, Hoists and Conveyors

Par. 9177. One or more safety catches, which will support the load, should a suspension pin fail, shall be installed on all mono-rail hoists operating on swivels. All trolley frames shall be safeguarded against spreading.

An approved hoist limiting device shall be provided on all jib cranes of 10 or more ton capacity.

A safety lowering device shall be provided on all crabs, winches and jib cranes.

An approved device which will automatically lock the load when hoisting is stopped shall be installed on every chain and electric hoist.

A warning device which will be sounded before cranes are put in motion or while the crane is traveling shall be provided on all locomotive and gantry cranes.

Operation of Cranes, Hoists and Conveyors

Par. 9178. Cranes which are operated from a platform or cab attached to the crane structure and power driven hoists of over two-ton capacity shall be operated only by regular crane operators, by authorized substitutes who have had at least two weeks experience or training under the supervision of a competent operator, or by crane repairmen or inspectors. No one but an authorized person shall enter a crane cage.

Persons under 18 years of age shall not be permitted to operate a power driven crane, hoist or conveyor.

Tools, fuses, oil cans, waste, personal belongings or clothing shall not be left loose on or about a crane, hoist or conveyor.

Cranes and hoists shall be examined for loose parts or defects each day on which they are in use.

When the power goes off, the operator shall immediately throw all controllers to the off position until the power is again available.

Before closing the main switch, the operator shall make sure that all controllers are in the off position.

Before starting to hoist the operator shall place the crane trolley directly over the load. No attempt shall be made with a monorail hoist to lift or move an object by a side pull unless the hoist is designed for that purpose. The arm or boom of a jib or pillar crane shall be directly over the load when making a lift.

Whenever an operator finds the emergency switch open he shall not close it, even when starting on regular duty, until he has made sure that no one is on or about the crane. He shall not oil or repair the crane unless the main switch is open.

Locomotive cranes shall not be moved except upon a signal from a regularly employed person authorized to give such signals. When passing corners of buildings the crane must be parallel with the truck.

When a weight is suspended from a crane or hoist hook the operator shall not leave his position at the levers for any purpose until the material on the hook has been lowered to the ground.

Tests for Cranes, Hoists and Conveyors

Par. 9179. Every crane, hoist or conveyor before being placed in regular service shall be subjected to a contract-load test, made at contract speed under the supervision of the Buildings Engineer. Approval of any such crane, hoist or conveyor shall be granted only upon satisfactory completion of such test.

SECTION 918

DUMBWAITERS, SPECIAL ELEVATORS AND HOISTS

General Requirements for Dumbwaiters, Special Elevators and Hoists

Par. 9180. Every dumbwaiter, special elevator and special hoist before being placed in regular service shall be subjected to a contract load test and to a car and counterweight safety test, wherever such safeties are required, made under the supervision of the Buildings Engineer, in accordance with the applicable requirements in Paragraph 9129. Approval of any such device shall be granted only upon satisfactory completion of such tests.

Special lifting and lowering devices designed with apparatus or equipment to which this Code cannot be applied shall not be installed except by special approval of the Buildings Engineer.

Dumbwaiters

Par. 9181. The overtravel at the top and at the bottom of power dumbwaiters, except at the top of undercounter dumbwaiters, shall be not less than 9 inches for speeds up to 100 feet per minute, one foot six inches for speeds from 100 to 200 feet per minute, and two feet six inches for speeds greater than 200 feet per minute.

Belt-driven dumbwaiters and hand-rope operated power dumbwaiters are prohibited.

Power dumbwaiters, except hydraulic dumbwaiters, shall be equipped with brakes which are automatically applied when the power is cut off.

Power dumbwaiters having a travel of more than 30 feet, a capacity of more than 100 pounds and operated by winding-drum machines shall be provided with a slack-cable device which will cut off the power and stop the car if the car is obstructed in its descent.

Power dumbwaiters shall be provided at each terminal with means independent of manual operation to automatically stop the car within the limits of overtravel.

Cars for dumbwaiters shall be of such strength and stiffness that they will not deform appreciably if the load leans or falls against the sides of the car. They shall be made of wood or metal, of solid construction.

Cars for power dumbwaiters shall be reinforced with metal from the bottom of the car to the point of suspension. Metal cars shall be of metal sections rigidly bolted, welded or riveted together, except that shelves may be hinged or removable.

Dumbwaiter cars, machines, and hoisting ropes or cables shall be capable of sustaining at least the loads given in the following table with factors of safety not less than those given in this Paragraph. The motive power is not required to be sufficient to raise the structural-capacity load, but shall safely lower it.

TABLE 9181T

Effective Platform Area in Square Feet	Structural Capacity in Pounds
4	100
5	150
6.25	300
9	500

All dumbwaiter cars and their counterweights shall run in guides. The guide rails shall be of steel except that:

a. Dumbwaiters having a capaciy of more than 20 pounds and a speed not in excess of 100 feet per minute and their counterweights may have guide rails of metal, wood, or metal and wood bolted together;

b. Hand dumbwaiters having a capacity of not more than 20 pounds and their counterweights may have guide rails of metal, wood, metal and wood bolted together, metal tubes, or spring-steel wires maintained in tension by turnbuckles.

Guides shall be rigidly secured to the hoistway and their joints shall be either tongued and grooved, doweled, or fitted with splice plates. One set of guides may be used for both the car and the counterweight.

All overhead machinery for dumbwaiters shall be securely fastened to its supports. Overhead bearings, except for hand dumbwaiters, shall be placed on the tops of the beams or structural parts to which they may be secured, except that idler sheaves may be placed below the beams if the parts of the bearings in tension are of steel or wrought iron. Where machines are installed in the pit they shall be accessible through a door opening at the machine level instead of through any landing door. A substantial platform shall be provided over all such machinery. In such cases, controls shall not be located in the shaftway.

The factors of safety for dumbwaiter machines, based upon the static loads shall be not less than:

6 for steel, and

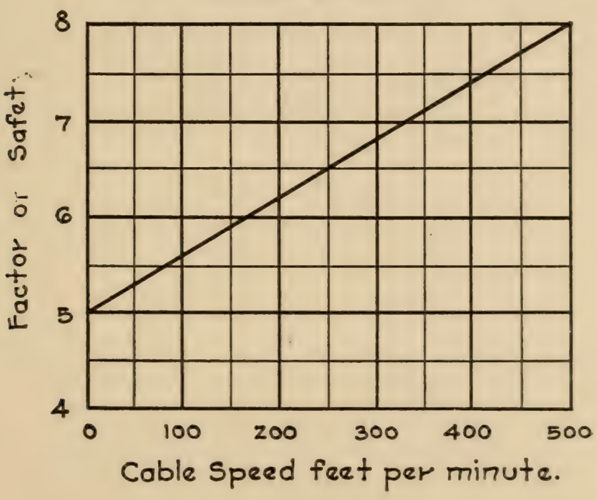
9 for cast iron or other materials.

Sections of counterweights for dumbwaiters having a capacity exceeding 100 pounds or having a speed exceeding 100 feet per minute shall be secured by at least two tie rods passing through holes in all sections, unless suitable counterweight frames or boxes are provided. The tie rods shall have lock nuts at each end. The lock nuts shall be secured by cotter pins.

Power dumbwaiters, except those of the direct-plunger type, shall be provided with one or more iron or steel hoisting cables, roller chains or tapes. Where cables are exposed to corrosion, they shall be covered with marline or other equivalent protective covering.

The factor of safety for car and counterweight cables for dumbwaiters based on the static loads shall be not less than the values given in Diagram 9181D, corresponding to the contract speed of the car. For tapes, the factor of safety in Diagram 9181D shall be increased by at least 25 per cent and for roller chains the factor of safety shall be not less than 5.

DIAGRAM 9181D



Cables and tapes of power dumbwaiters shall not be lengthened or repaired by splicing.

The winding-drum end of cables and tapes shall be secured by clamps inside the winding drums and shall have not less than one turn of cable or tape on the winding drum when the car or counterweight has reached the extreme limit of its overtravel.

Stage, Orchestra and Organ-Console Elevators

Par. 9182. The net lifting capacity of stage elevators shall be equal to all the superimposed fixed loads plus a live load of not less than 75 pounds per square foot on the clear floor area of the platform.

The net lifting capacity of an orchestra elevator shall be equal to a live load of not less than 30 pounds per square foot on the clear floor area of the platform.

Platforms of stage, orchestra and organ-console elevators shall have steel framing. The stresses in the materials for platform members, cables and other equipment shall not exceed those permitted for electric passenger elevators.

When stage, orchestra and organ-console elevators are at their extreme lower limit of travel, there shall be at least two feet clearance vertically between the lowest projection on the underside of the car platform, exclusive of the supporting beams, and any obstruction in the pit, exclusive of the hoisting machine.

Operating switches shall be provided on the platform of orchestra and organ-console elevators. Emergency stop switches shall be placed adjacent to operating switches.

Where elevating screws are used, they shall be of the direct connected type, either worm-or beveled-gear driven, with all gears enclosed in a housing.

Where a stage, orchestra or organ-console elevator is not supported or operated by either plungers or screws, car safeties shall be provided under the platform capable of stopping and holding the platfrom with full rated load at any point of its travel.

When the travel of the stage, orchestra or organ-console elevator extends above the top of the shaftway enclosures, aprons shall be provided on the platform to enclose the space between the top of the shaftway and the underside of the platform, when the platform is at its limit of travel.

When orchestra and organ-console elevators are installed in the same shaftway, the adjacent sides shall be provided, in addition to the railings and toe boards, with aprons to avoid a shearing hazard.

Stairway Lifts and Invalid Elevators

Par. 9183. Stairway lifts and invalid elevators shall be installed only when a doctor's certificate stating their need is filed with the application. They shall be removed or sealed out of service upon the termination of the service for which they were originally installed.

The vertical travel of stairway lifts shall not exceed the height of one story, and that of invalid elevators shall not exceed 35 feet.

Stairway lifts and invalid elevators shall be designed for a live load of not less than 700 pounds and a contract speed of not more than 35 feet per minute. The equipment shall not be required to lift this load, but shall be designed to safely lower it.

Stairway lifts and invalid elevators shall be raised and lowered by means of cables, a screw or screws, chains, a plunger, or by other approved means. If cables or chains are used, there shall be not less than two of either and the car shall be equipped with a suitable safety, except that stairway lifts with approved safeties on the car may have only one cable.

Car frames shall be of steel.

Stairway lifts and invalid elevators shall be controlled by operating devices located on the car and at each landing. The operating devices shall be made operative only by the insertion of a key; such key shall not be removable when the operating devices are in the unlocked position. These devices shall be so arranged that only the one on the car or those on the landings can be made operative at one time.

The motion of stairway lifts shall be produced by electric motors driving worm-geared winding drums. They shall be equipped with automatic stops, attached to the machine at the winding drums, safeties attached to the car frames, final limit switches and slack-cable devices.

Invalid elevators shall be equipped with automatic stops, final limit switches, electrical or mechanical interlocking devices, and slack-cable devices.

Horizontal clearances for invalid elevators shall be not less than those required for power passenger elevators in Paragraph 9121.

Hoistways of invalid elevators shall have an enclosure at the bottom landing which meets the requirements of Paragraph 9110, unless the car is equipped with a safety which will instantaneously stop the car should the underside of the car touch any object as it is descending.

Plunger-type hydraulic invalid elevators shall also meet the requirements of Paragraph 9146, 9147, 9148 and 9149.

In all other respects, the construction and installation of stairway lifts and invalid elevators shall meet the approval of the Buildings Engineer.

Personal-Service Elevators

Par. 9184. Personal-service elevators shall meet all the requirements for power passenger elevators, except as follows:

a. The contract load shall not exceed 700 pounds.

b. The contract speed shall not exceed 50 feet per minute.

c. The travel shall not exceed 40 feet above the main entrance floor.

d. The pit may have a minimum depth of two feet.

e. The top clearance of the car may be reduced to three feet.

f. The hoistway-door interlocking device may be arranged to permit the car to move away from the landing a distance of not more than 12 inches before the locking operation takes place if the following requirements are met:

1. If the locking operation fails to take place as specified, further movement of the car will open the control circuit and apply the brakes.
2. The hoistway door shall be closed before the car can be started.
3. The car shall be equipped with a substantial vertical face flush with the outer edge and extending at least 12 inches below the car platform.

g. The broken-rope type of safety may be used instead of the safety operated by speed governors.

h. The diameter of sheaves and drums for hoisting and counterweight cables shall be not less than 30 times the diameter of the cable.

i. Hoisting ropes may be less than one-half inch in diameter, if the factors of safety specified in Paragraph 9127 are complied with.

j. The minimum number of car and counterweight cables shall be two.

Builders' Hoists

Par. 9185. Builders' hoists, with a travel of more than 15 feet, shall be equipped with safety devices which will bring the car to rest should the hoisting cable became slack or break.

No person shall be permitted to ride on a builders' hoist.

Elevators installed for permanent use may be used temporarily before completion during the construction of buildings for carrying workmen and material but only upon written approval of the Buildings Engineer. Such elevators shall be equipped with all the safety devices required for permanent elevators, except hoistway door interlocks and car-gate contacts, which safety devices shall be tested before being placed in service.

Temporary cars on permanent elevator installations and permanent elevator cars, when put into temporary use, shall be provided with covers and five-foot high enclosures on all sides, except at the car entrance. Hoistways not permanently enclosed shall be enclosed by a temporary enclosure at least 5 feet 6 inches high at all landings. The landing openings in the enclosures shall be protected by a hinged gate not less than 5 feet 6 inches in height or a bar not less than 3 feet 6 inches above the landing and set back at least 18 inches from the landing sill, unless permanent gates or landing doors are installed.

Automobile Hoists

Par. 9186. Automobile hoists include all hoists or lifts used for servicing vehicles. They are classified as follows:

Full-hydraulic-automobile hoist.
Semi-hydraulic-automobile hoist.
Geared-automobile hoist.

Full-hydraulic-automobile hoists include all hoists which are raised or lowered entirely by the hydraulic action of a liquid.

Semi-hydraulic-automobile hoists include all hoists in which air chambers and liquid chambers are directly connected so that the raising or lowering is performed by the combined action of the liquid and the air.

Geared-automobile hoists include all hoists operated by gears attached to ratchets or electric motors.

Automobile hoists shall be designed for the loads they are intended to carry but for never less than 8000 pounds. The factor of safety in the various members shall be not less than those specified in Paragraph 9171.

All automobile hoists, except those using axle supports, shall be provided with automatic wheel stops.

Full-hydraulic-automobile hoists shall be provided with self-closing-operating valves and with retarding valves at the cylinders which, if the pumps, piping or tanks should break or leak, will not permit the runways to be lowered faster than nominal lowering speed.

Semi-hydraulic-automobile hoists with tanks, piping and fittings which meet the requirements of "Unfired Pressure Vessels", Section 935, shall be provided with an oil locking device at the cylinder which, if the piping or pressure tank should break or leak, will not permit the runways to be lowered faster than the normal lowering speed. Semi-hydraulic-automobile hoists with tanks, piping and fittings which do not meet the requirements of "Unfired Pressure Vessels" shall be provided with a safety strut or other positive mechanical devices which will maintain the runways in the elevated position regardless of the pressure in the system. Such mechanical devices shall be so constructed that they will return automatically to the locked position immediately after the pressure on the operating lever or button is removed.

Geared-automobile hoists shall be provided with upper and lower travel safeties, and approved locking devices which will lock automatically when the pressure on the operating lever or button is removed.

Man Lifts

Par. 9187. Man lifts are classified as man lifts of the endless belt type and man lifts of the platform type.

Man lift of the endless belt type shall mean a device consisting of an endless, vertical belt, provided with steps and handholds, which travels over fixed pulleys at the top and bottom limits of travel.

Man lift of the platform type shall mean a lift consisting of a platform suspended from a crosshead hung on a cable running over an overhead sheave to a counterbalance of the approximate weight of the lift and a man and the movement of which is by hand power only.

Man lifts and all parts thereof, except cables, shall be designed, constructed and erected in such a manner as to provide a factor of safety of not less than 6. Cables shall have a factor of safety of not less than 8.

Persons, other than employees, shall not be permitted to ride a man lift at any time and not more than one person at a time shall be permitted to ride a man lift of the platform type.

Freight shall not be carried on a man lift.

Tools shall not be carried in the hands of persons on man lifts, nor in their pockets, when such tools protrude from the pockets.

Conspicuous signs carrying instructions for use of man lifts shall be posted at each landing.

The speed of a man lift shall not exceed 50 feet per minute.

All machinery in connection with man lifts shall be guarded in accordance with the requirements of Chapter 92.

The equipment for man lifts of the endless belt type shall be set upon a substantial support and shall be securely fastened at top, bottom and at intermediate landings.

Landings for man lifts of the endless belt type shall be provided with openings, on both the up and down sides, not less than 32 inches in width for a 12-inch man lift and 36 inches for a 16-inch man lift, and not less than 24 inches in depth measured from the belt. All openings shall be uniform in size. The sides of the openings shall be semi-circular and the front of the openings shall be parallel to the belt.

Enclosures of standard guard rail, wire screen, grille or metal shall be provided around openings at each landing for man lifts of the endless belt type, allowing only sufficient opening for ingress and egress to the lift steps, and placed so as to have a landing space of not less than 2 feet deep. Openings in rails or guards shall be provided with a maze or staggered opening, or a self-closing gate or rail, swinging only away from the man lift if of the swinging type. Floors inside of railings or guards shall be of the non-slip type and shall be maintained at all times in a non-slip condition.

Funnel shaped sheer plates of metal not less than No. 16 U. S. Standard gauge shall be provided, set at an angle of not less than 60 degrees with the horizontal and extending downward not less than 2 feet, at every point of up travel at which there is a projection within 2 feet of any point on the periphery of the tread and in front of the plane of the belt. The bottom of the funnel shall have a smooth, rounded edge of not less than one-half inch diameter.

The minimum clearance for man lifts of the endless belt type between the head or top pulley and the roof or other overhead obstruction shall be not less than 4 feet.

A person, while ascending or descending, shall have control of the man lift at all times by means of a manually operated stopping device installed so that it is readily accessible throughout the entire travel of the lift and so arranged that the man lift will be stopped and locked when the stopping device is pulled in the direction of the belt travel.

An electrical or mechanical device shall be provided that will automatically shut off the power and apply a positive brake to the machinery in the event that a passenger fails to alight at the top landing. The man lift shall be so arranged that the belt cannot travel more than 2 feet in either direction after the automatic stop is thrown and cannot be again started except from above the upper landing.

The man lift machinery shall be equipped with adequate means to keep the belt at the proper tension and also prevent the belt from slipping on the pulleys.

Step treads for man lifts shall be not less than 10 inches deep and 12 inches wide, uniform in size, securely fastened to the belt at intervals of at least 16 feet and so attached that they will remain at right angles to the belt while ascending or descending. The minimum distance between the edge of the step tread and the opening of the floor, measured at right angles to the plane of the belt, shall be 14 inches.

Handholds with at least 9 inches gripping surface and not less than 2 inches clearance from the belt shall be securely attached to the belt at points approximately 4 feet above and below each step tread. There shall be neither step nor handhold available without a corresponding handhold or step.

Warning signs or signals shall be provided at points just before reaching top and bottom landings of man lifts of the endless belt type.

The car for man lifts of the platform type shall be enclosed to a height of at least 6 feet on the sides not used for the entrance. The enclosure shall be of such strength that it will deflect not more than one-quarter inch if subjected to a force of 75 pounds applied perpendicularly to the car enclosure at any point. The car shall be provided with a top of metal or other incombustible material capable of sustaining a distributed load of 300 pounds.

The car platform for man lifts shall not exceed 900 square inches in area and shall have head room of not less than 6 feet 6 inches. The car and platform shall be of metal or sound wood.

The hoistway enclosures and hoistway doors for man lifts of the platform type shall meet all of the applicable requirements of Paragraphs 9110 and 9111, respectively.

Man lifts of the platform type shall have a broken-cable safety brake operated with a cam or ratchet and pawl designed to stop and hold the platform if the hoisting cable breaks. Cast iron shall not be used on any part of a safety grip subject to tension.

Man lifts of the platform type shall have a foot brake engaging both guide rails and operated by a spring designed to apply automatically when the operator's foot is removed from the brake pedal.

Platforms and counterweights for man lifts shall run in guides within the hoistway enclosure, except that the counterweight guides may be omitted if the counterweight is enclosed for the full height of its travel. The guides for both car and counterweight shall be securely fastened.

A speed retarder shall be used on each man lift of the platform type to apply the brake if the car speed exceeds 50 feet per minute. This speed retarder shall be located so that it cannot be struck by the car in case of overtravel.

CHAPTER 92

POWER MACHINERY

Sec. 920—General Regulations for Power Machinery.
Sec. 921—Power Transmission Equipment.
Sec. 922—Machinery Supports.
Sec. 923—Prime Movers and Engines.
Sec. 924—Cutting Machinery.
Sec. 925—Rolling Machinery.
Sec. 926—Pressing and Stamping Machinery.
Sec. 927—Abrasive Machinery.
Sec. 928—Miscellaneous Machinery.
Sec. 929—Guards.

SECTION 920

GENERAL REGULATIONS FOR POWER MACHINERY

Scope of Power Machinery Regulations

Par. 9200. Chapter 92 of the Building Code applies to power machinery and equipment installed within or on buildings, and on premises. It does not apply to power machinery installations on ships, locomotives, railway cars and automotive equipment.

Definitions

Par. 9201. The definitions contained in this Paragraph of certain terms and nomenclatures are to apply for the correct interpretation and application of the same terms and nomenclatures when they appear elsewhere in this Chapter.

Abrasive Wheel shall mean power driven wheels which consist of abrasive particles held together by artificial, natural, mineral or organic bonds.

Automatically Fed shall mean placing material in machine to be worked on by a mechanically actuated device that does not require the attention of an operator at each stroke of the ram.

Belt Shifter shall mean a device for mechanically shifting belts from tight to loose pulleys or vice versa, or for shifting belts on cones of speed pulleys.

Encased: See guarded.

Enclosed: See guarded.

Exposed to Contact shall mean that the location of an object is such that a person is liable to come into contact with it and be injured.

Filler shall mean the material used to cover or fill in the openings of or between the members of guards.

Flywheel shall mean a wheel or pulley used to oppose and moderate by means of its inertia any fluctuations in torque.

Gears shall mean a train of gears comprising two or more intermeshing gears.

Guarded (Encased or Enclosed) shall mean that the object is so covered, fenced or surrounded that contact which may result in injury, at the point of danger, is remote.

Guarded by Position shall mean that the object is so located that contact which may result in injury is unlikely to occur.

Hazardous shall mean that the location of an object is so accessible as to permit contact that may result in injury.

Horizontal as applied to belts, ropes and chains, shall mean that the same are running in an approximately horizontal direction.

Inclined as applied to belts, ropes and chains shall mean that the same are running in a direction between 30 and 60 degrees of the horizontal.

Jack Bar shall mean some form of lever used to rotate flywheels by hand.

Machinery shall, in general, mean prime movers, engines, power transmission and machines, and the working parts of same.

Manually Fed shall mean placing material in machine to be worked on by hand or hand tools.

Point of Contact shall mean the point or points of an object exposed to contact that can be contacted by persons. (See Exposed to Contact.)

Point of Operation shall mean that point at which cutting, shaping, or forming is accomplished upon the material or stock and shall include such other points as will offer a hazard to the operator in inserting or manipulating the stock in the operation of the machine.

Protection Band shall mean a continuous band placed around a cup, cylinder, or sectional ring abrasive wheel to effectually retain the pieces of such a wheel which might break in operation.

Protection Chuck shall mean a chuck used to mount cup, cylinder, or sectional ring abrasive wheels.

Protection Flange shall mean flanges designed to be used with abrasive wheels of special shape, in such a manner as to effectively retain the parts of the wheel should it break in operation, in addition to the usual function of clamping the wheel to the spindle.

Protection Hoods shall mean an enclosure consisting of a peripheral and two side members.

Pulley shall mean a wheel with a flat or approximately flat periphery.

Ram when applied to presses and hammers, shall mean the moving part of the press acting directly on the material or stock.

Securely Fastened shall mean that the device or object referred to shall be so secured in place that it cannot be moved under normal or reasonably forseen conditions or circumstances.

Self-Oiling shall mean that a part needs oiling at only infrequent intervals, at least for the duration of the working shift or day.

Semi-Automatically Fed shall mean placing material in machine to be worked upon by some mechanical device which is fed by an operator at the beginning of each cycle of machine operations.

Sheave shall mean a pulley having regularly spaced grooves in its periphery.

Sprocket shall mean a wheel having evenly spaced projections or teeth on its periphery to engage with some form of chain.

Toe Board shall mean a guard set on edge directly on floor under a rail or railing.

Vertical as applied to belts, ropes and chains, shall mean that the same are running in a vertical direction or in a direction within 30 degrees of the perpendicular.

Clasification of Power Machinery

Par. 9202. For the purposes of this Code, power machinery shall be classified according to the following:

1. Prime Movers and Engines.
2. Power Transmission.
3. Machines.

Machines shall be further classified according to the operation performed. The classification shall be:

- a. Cutting Machinery.
- b. Rolling Machinery.
- c. Pressing and Stamping Machinery.
- d. Abrasive Machinery.
- e. Miscellaneous Machinery.

Applications, Permits and Certificates for Power Machinery

Par. 9203. Applications shall be filed and permits secured for the installations of power machinery, as required in Part I.

Mechanical certificates, when desired, will be issued upon satisfactory completion of power machinery work.

Where power machinery is relocated within the premises of the same owner, the Buildings Engineer may waive the requirement for permit, if such relocation does not cause stresses in the supporting structural members which are in excess of the stresses permitted in Part VI.

Design and Construction of Power Machinery

Par. 9204. The design, construction and installation of power machinery shall be in accordance with accepted principles of mechanics so that it may be safely operated under the required conditions and will also meet the approval of the Buildings Engineer.

Inspection of Power Machinery

Par. 9205. Inspection of power machinery shall be made in accordance with the requirements of Paragraph 1663.

Location of Power Machinery

Par. 9206. Power machinery shall be so located within the building as to provide aisles as required in Part IV.

No part of any power machinery, nor the operators in continual attendance at machines, nor the materials when being worked on by machines, shall be allowed to encroach upon, or reduce the width of required passageways, aisleways, horizontal exits, stairways, ramps, or any other means of egress.

Existing Power Machinery

Par. 9207. All existing power machinery in service which does not comply with the provisions of this Code shall be made to conform to the requirements of this Code or put out of service and sealed or removed as directed in writing by the Buildings Engineer if such machinery or the location thereof is or creates a menace to either life or property.

Operation and Maintenance of Power Machinery

Par. 9208. All power machinery when in operation shall be kept in proper working condition, and shall be attended and controlled by authorized and competent persons.

All safeguards, safety appliances or devices attached to power machinery shall be kept in good condition, and any safeguard, safety appliance or device removed or made ineffective for the purpose of making repairs or readjustments shall be replaced immediately upon completion of the repairs or adjustments.

Penalties for Violations of Power Machinery Regulations

Par. 9209. For penalties for violations of Chapter 92 of this Code, refer to Paragraph 1922 of this Code.

SECTION 921

POWER-TRANSMISSION EQUIPMENT

Scope of Power-Transmission Equipment

Par. 9210. Power-transmission equipment shall include all mechanical means of transmitting power from a prime mover, engine or motor up to, but not including, belts, gears, chains or other similar devices running to a shaft supported by or being a part of the machine being driven. Those belts, gears, chains or other similar devices running to an integral part of the machine shall be considered a machine part, except where they pass through floors or rooms other than the room in which the machine is located. In such cases, all parts not in the room with the machine shall be considered power-transmission equipment.

Also, any shafting, pulleys, belts, gears, chains or similar devices transmitting power to more than one machine shall be considered power transmission equipment.

Also, pulleys, sheaves, gears and sprockets on prime movers, and engine crankshafts shall be considered power-transmission equipment.

Where a prime mover, engine, or motor drives but one machine through a single countershaft or jackshaft, all the transmission equipment between the prime mover, engine or motor and the machine shall be considered a part of the machine provided it is in the same room as the machine.

General Requirements for Power-Transmission Equipment

Par. 9211. The installation of power-transmission equipment, including foundations, footings, supports and anchoring, shall comply with the requirements in Section 922.

Where power-transmission equipment cannot be easily observed from its control station, effective signals or means of signaling shall be provided to give positive and ample warning before starting the power-transmission equipment.

Where necessary, in the opinion of the Buildings Engineer, emergency means properly marked and easily accessible shall be provided in each room, section or department by which each complete and separate unit of power-transmission therein can be quickly stopped.

The requirements in Paragraphs 9212 to 9219, inclusive, for guarding power transmission equipment shall not apply to the following exceptions:

> Power-transmission equipment so located with respect to other power machinery, and building structures, that it is guarded by position. However, belts shall be fastened or spliced in an approved manner.
>
> Flanged pulleys carrying belts less than one inch in width, flat or crowned pulleys carrying single-ply belts less than 2 inches in width and double-ply belts one and one-and-one-half inches in width, and sheaves carrying belts having an average cross-section of less than one-fourth inch in diameter, provided the belts are fastened or spliced in an approved manner.
>
> Hand-operated gears and sprockets that do not continue to move after the hand power has been removed.

Where an accumulation of combustible dust and flyings creates or may create a fire hazard, the Buildings Engineer may permit a deviation from the requirements of Section 921.

Where and when static electricity exists in power-transmission equipment in the presence of explosive or flammable gases or dust, the moving parts of the equipment, including belts and ropes, shall be thoroughly grounded.

Power-Transmission Equipment in Special Locations

Par. 9212. Power-transmission equipment located in basements, towers and rooms used exclusively for power-transmission equipment shall be guarded in accordance with the applicable requirements of this Chapter, except that the requirements of this Section for safeguarding power-transmission equipment may be waived by the Buildings Engineer, provided all the following conditions are complied with:

That the basement, tower, or room occupied by the power-transmission equipment shall be locked against unauthorized entrance.

That the vertical clearance in passageways between the floor and any object overhead shall be not less than 7 feet 6 inches.

That the flooring shall be dry, firm and level.

That the route followed by any authorized person or persons maintaining the equipment shall be guarded where necessary to prevent accidents.

Shafting

Par. 9213. Each continuous line of shafting, whether horizontal, vertical or inclined, shall be securely held in position against excessive endwise movement and thrust.

All parts of horizontal inclined or vertical shafting, including clutches, pulleys, sheaves, gears or sprockets, shall be guarded where such parts are located 6 feet or less from a floor, or 15 feet or less if located over driveways, except horizontal shafting accessible for a distance of 2 feet or less.

Shaft ends 6 feet or less from the floor, or projecting 4 inches or more beyond outside parts of transmission equipment shall be guarded. Where the shaft end projects less than 4 inches beyond outside part of transmission equipment, no guard is necessary, provided the shaft end is finished smooth, has rounded edge and is free from projections.

Pulleys, Sheaves, Gears and Sprockets

Par. 9214. Pulleys and sheaves operating with a rim speed in excess of 4000 feet per minute shall be specially designed and carefully balanced to the satisfaction of the Buildings Engineer.

Composition or laminated wood pulleys and sheaves used in places where they will be subjected to the action of moisture or other harmful vapors shall be of such materials which will not be affected by them.

Pulleys, sheaves, gears and sprockets that are cracked, broken, distorted or unbalanced or impaired in any other way shall not be used.

The guarding of all pulleys, sheaves and sprockets shall be in accordance with the requirements for guarding the belts, ropes or chains which they drive, or with which they are driven, as required in Paragraph 9215.

Flywheels shall be guarded as required in Paragraph 9235.

Gears shall be guarded as follows:

By complete enclosure, or

By partial enclosure guarding completely the exposed top, sides and ends where the mesh-point is within one foot of the floor, or

By a band guard covering the face of the gear or gears, and having its flanges or side members extending inward to the center of the gear to a point beyond the root of the teeth on the exposed sides.

All overhanging pulleys on line, jack, or counter shafts with no bearing between the pulley and the outer end of the shaft shall be provided with a guide to prevent the belt from running off the shaft.

Belt, Rope and Chain Drives

Par. 9215. All horizontal, inclined, or vertical belts, ropes, chains, including pullies, sheaves, sprockets, or any parts thereof, which are less than 7 feet from the floor or other walkway, shall be protected with applicable guards in accordance with Section 929.

Belt, rope and chain drives located in power plants, and power-development rooms used exclusively for the purpose of power-development may be protected where required by guard rails.

The continuous system of rope drive, if not located and guarded in such a manner that the condition of all parts of the rope can be constantly and conveniently observed, shall be equipped with an electrically operated "tell-tale" device to give warning when the rope begins to fray.

Belts carried on step-cone pulleys may be considered guarded if the belt is provided with an approved belt shifter and all parts of the step-cone pulley are 3 feet or more above the floor.

Friction Drives

Par. 9216. The drive point of all friction drives when exposed to contact shall be guarded.

All arm or spoke friction drives and all web friction drives with holes in the web shall be entirely enclosed by a guard.

All projecting bolts on friction drives shall be guarded where exposed to contact.

Belt Shifters

Par. 9217. All tight and loose pulley sets shall be provided with a permanent belt shifter with operating handle.

All belt shifters shall be provided with mechanical means to prevent the belt from creeping from the loose pulley to the tight pulley when the shifter is in the "off" position.

Operating handles of belt shifters shall not be exposed to accidental contact, but shall be within easy reach of the operator from any operating position.

Where operating handles of belt shifters are not located directly over machines or benches, they shall be at least 6 feet above the floor.

All belt shifters and their operating handles, where suspended overhead, shall be so hung and balanced that by their own weight the belt will be kept on the loose pulley or in a disengaged position.

Collars, Couplings and Clutches

Par. 9218. All revolving collars and couplings which are not smooth and cylindrical in shape or which have screws, bolts, or other projections in revolving parts, shall be guarded where such collars or couplings are less than 7 feet from floor or other walkway, or within 18 inches of bearings that are not self-oiling.

Clutches and clutch pulleys having projecting parts and located 7 feet or less above the floor or other walkway, or within 18 inches of bearings that are not self-oiling, shall be enclosed by a guard.

Operating handles of clutches shall conform to the same requirements for operating handles of belt shifters in Paragraph 9217.

Miscellaneous Power Transmission Equipment

Par. 9219. Belt tighteners shall be provided with means to prevent them from falling below a fixed point, and shall be guarded as required for the belt rope or chain which they tighten.

Counterweights shall be guarded to prevent accidents in case the weight should fall.

No metal belt fasteners of any kind shall be used in the presence of explosive or flammable gases or dust.

All revolving projections on shafting and shaft equipment, including keys, bolts, screws and grease or oil cups shall be enclosed with a guard or made flush, except keys and screws within gear or sprocket casings, and keys, bolts, screws and grease or oil cups in the hubs of pulleys and sheaves of less than 20 inches in diameter where they are within the plane of the rim of the pulley or sheave.

Keyways in the ends of shafting located 6 feet or less above the floor, and where the shaft projects 2 inches or more beyond outside parts of shaft equipment, shall be filled or enclosed with a guard.

SECTION 922

MACHINERY SUPPORTS

General Requirements for Machinery Supports

Par. 9220. All power machinery, except of the portable type, shall be securely and permanently supported in operating position.

All supports for power machinery shall be sufficient to support the weight of the machinery, and sufficiently stable to withstand any forces exerted upon them by the machinery in performing the required functions.

Supports for prime movers and engines, motors, generators, and other machines subjected to extremely heavy duty shall rest on foundations independent of the structural frame and footings of the building, and shall have no tie-in therewith. All such power machinery creating excessive vibrations shall either be provided with approved means between it and the support to absorb the vibrations, or the support shall be independent of the structural frame and footings of the building. Other prime movers and engines may, with the approval of the Buildings Engineer, be supported by the building structure.

Piers and Footings for Machinery

Par. 9221. The design and construction of piers and footings for power machinery shall comply with the requirements of Part VI and Chapter 70.

Power machinery piers or footings shall be so located that the forces exerted thereon will not be applied or transmitted to any adjacent building or other structure.

Structural Supports for Machinery

Par. 9223. Structural supports for power machinery shall be designed and constructed in accordance with the applicable requirements of Parts VI and VII.

Building Structure as Support for Machinery

Par. 9224. Except as noted in Paragraph 9220, the building structure may be used as a support for power machinery if the stress created by the machinery and other loads due to the weight, impact and vibration are within the allowable stress permitted for the structure as given in Part VI. In the case of machines, the weight of the material or stock being worked upon shall be included in the weight of the machine.

Anchoring Machinery

Par. 9225. All machinery shall be anchored sufficiently to prevent its movement due to forces exerted by itself in its normal operation.

SECTION 923

PRIME MOVERS AND ENGINES

Scope of Prime Movers and Engines

Par. 9230. Prime movers and engines shall include steam, gas, oil, air and hydraulic reciprocating engines; steam, air and hydraulic turbines; air, gas and ammonia compressors, and all other similar machines. For dynamos and motors, refer to Part VIII.

Supply and Exhaust Piping

Par. 9232. All steam supply and exhaust piping, including appurtenant appliances, to and from prime movers and engines shall be in accordance with Sections I and II of the American Society of Mechanical Engineers Boiler Construction Code, 1937 Edition.

Such piping and appliances shall be properly and safely supported and the piping shall be so arranged and supported that the equipment and apparatus to which it connects and the piping system will not be subjected to undue strains caused by expansion and contraction of the piping. All piping subjected to excessive temperature changes shall be provided with approved means to take care of expansion and contraction.

Where main supply pipe lines branch, the branch line shall be provided with a valve located adjacent to the main line.

Steam supply pipes connected to engines shall be provided with an effective separator or ample drains directly above the engine throttle.

Where emergency throttle or stop valves are not accessible from the floor, fixed ladders shall be provided to give access.

All steam pipes with a steam pressure of more than 15 pounds per square inch, and located within 7 feet of the floor and exposed to contact shall be insulated.

Steam traps used to discharge water from steam separators in a manner which may be injurious to persons, shall be so installed that their operation will be evident.

In discharge piping from compressors, should a stop valve be placed between the compressor and the receiving tank, a safety valve shall be placed between the stop valve and the compressor.

Exhaust piping from steam, gas and oil reciprocating engines, and from steam turbines that exhaust freely into the atmosphere, shall be carried to a point outside of the building or structure in which the prime mover or engine is located. No exposed exhaust piping shall be located outside of any building or structure within 12 feet of the ground, nor shall it be located over any street, alley or other public way, nor terminated within 50 feet horizontally of any street, alley or other public way. All exhaust piping shall be terminated with an approved exhaust head or muffler as the case may be.

The discharge from hydraulic turbines, and the exhausts from steam, gas and oil prime movers and engines and condensers when connected to the storm water drainage system of the City of Baltimore, shall conform to the requirements of the Health Department. No discharge or exhaust of any character shall be connected to the sanitary sewerage system.

Speed Control for Prime Movers and Engines

Par. 9233. Each prime mover and engine shall be provided with an effective governor which will at all times automatically control the speed of the prime mover or engine, except where the load itself acts as an effective governor.

All fly-ball governors shall have an automatic stop to shut off the supply of power in event of derangement of the governor.

Prime movers and engines not controlled by fly-ball governors shall have their valve gears so arranged, or other provisions made, that in the event of the load being removed, the prime mover or engine will stop if the governor fails to function.

Prime movers and engines of 300 horsepower or more shall be equipped with an approved automatic independent speed limit device, except reversing engines connected by shafting, couplings, or gears to a constant load.

Steam Condensers and Receivers

Par. 9234. Jet condensers shall be provided with automatic vacuum breakers to prevent water entering the engine, except in connection with turbines where they may hinder the operation.

Condensers used with prime movers and engines equipped with speed limit stops shall be provided with a vacuum breaker that may be made to function when the speed limit stop is tripped.

All receivers and tanks receiving exhaust vapors or gases from prime movers and engines, and receiving the discharge from compressors shall comply with the applicable requirements of Section 935.

Guarding Flywheels

Par. 9235. Flywheels located so that any part of the lower portion is 6 feet or less above the floor shall be enclosed by a guard of a height given in table in Paragraph 9292, or surrounded by a guard rail. The guard rail, if used, and if the bottom of the rim of the flywheel is within 12 inches above the floor or projects below the floor, shall be provided with a toe-board guard.

Where the top of the rim of the flywheel is 42 inches or less above the floor, the flywheel shall be enclosed on top and sides by a guard, or surrounded by a guard rail with toe-board guard or by a guard of a height given in table of Paragraph 9292.

Flywheels with smooth rims 5 feet or less in diameter and having spokes or open web centers may be considered guarded if the spokes or open web centers are covered on the exposed sides by disk guards in accordance to the requirements of Paragraph 9294. The disk guard shall present a smooth surface and edge, and shall have means for inspection behind it. An open space not exceeding 4 inches may be left between the edge of the guard and the rim of the flywheel to facilitate turning over the flywheel. All keys or other projections not covered by the disk guard shall be made flush or covered by a cylindrical enclosure.

Guards enclosing flywheels of gas and oil engines may be made adjustable to allow starting the engine and for running adjustments.

Guards for flywheels shall have no door or opening other than a slot opening for jack-bar. Hinged or removable sections for the purpose of making adjustments and for the admission of oil and grease are not considered openings and shall conform to the requirements of Paragraph 9291.

Guard rail for flywheels shall be continuous and without doors or gates.

Guarding Cranks, Connecting Rods, and Cross Heads

Par. 9236. Cranks, connecting rods, and crossheads, unless located so that the point of contact is guarded by position, shall be guarded according to the same requirements as for guarding flywheels in Paragraph 9235, except that the requirements for disk guarding do not apply in this case.

Guarding Tail Rods

Par. 9237. Tail rods or extension piston rods shall be enclosed with a guard to prevent contact with moving end, or they may be surrounded with a guard rail having a clearance of not less than 15 inches when the rod is fully extended.

Guarding Governors

Par. 9238. Governor balls 6 feet or less from the floor, where exposed to contact, shall be provided with a guard enclosure extending to the top of the governor balls when at their highest position.

Other moving parts of governors including belts, pulleys and gears, where exposed to contact, shall be guarded according to the applicable requirements of Section 921.

All pulleys, sheaves, gears, and the like used to drive governors shall be keyed to their respective shafts.

SECTION 924

CUTTING MACHINERY

Scope of Cutting Machinery

Par. 9240. The requirements of this Section shall apply to all stationary power driven machines used for the purpose of obtaining or applying a cutting operation on material, substance or objects. Hand and foot powered cutting machinery shall also be included where so mentioned.

Classification of Cutting Machinery

Par. 9241. For the purpose of this Code, cutting machinery shall be classified according to the following:

1. Band saws and knives.
2. Circular saws and knives.
3. Rotating knives.
4. Cutting heads.
5. Boring heads.
6. Shears and cutters.
7. Miscellaneous cutting machinery.

General Requirements for All Cutting Machinery

Par. 9242. Each machine, except such driven by a flat belt one inch or less in width or a round belt one-half inch or less in diameter, shall be provided with an effective starting and stopping device that will safely control the machine.

Except when a machine belongs to a group of machines comprising one operating unit, the individual machine starting and stopping device may be omitted provided the group is started and stopped as a unit. Moreover, a sufficient number of stopping devices, in addition to the starting device, shall be provided at and around the group of machines operating as a unit to permit quick stopping in case of emergency, to the satisfaction of the Buildings Engineer.

All moving parts of machines, together with belts, pulleys, gears, chains or similar devices delivering power to and within the machine, located 6 feet or less above the floor and not guarded at the point of contact by position or not completely enclosed by the housing of the machine, shall be guarded according to the requirements of Section 921.

All points of operation and such other points that constitute a hazard to the operator in inserting, withdrawing or manipulating the stock during the operation of the machine shall be guarded in accordance with the requirements of this Section and shall meet the approval of the Buildings Engineer.

Band Saws and Knives

Par. 9243. All band saws and knives shall be completely enclosed or guarded except that portion between the guide and the table.

The wheels carrying the band saws and knives shall also be completely enclosed or guarded.

Circular Saws and Knives

Par. 9244. The exposed portions of all circular saws and knives above the table shall be completely enclosed with a hood guard capable of adjusting itself to the thickness of the material or stock while being cut.

Swinging circular saws and knives shall be completely enclosed with a hood guard around the upper half, and shall be provided with a device that will automatically return the saw or blade to a point over the table from any other point in its travel.

Rotating Knives

Par. 9245. Knives rotating in a container or chamber shall be provided with necessary guard enclosures.

Also, the machine shall be provided with a device that will automatically shut off the power to the machine in event either the guard enclosure is removed or the container or chamber is opened for repairs or adjustments or for changing.

Cutting Heads

Par. 9246. Cutting heads shall be provided with adjustable guards that will automatically cover the entire cutting head when not in use and the unused portions when in use.

Boring Heads

Par. 9247. For single spindle wood working machines, the bit shall be enclosed in a cylindrical sleeve which extends beyond the cutting end of the bit when it is in the withdrawn position.

For multiple spindle wood working machines, the bits shall be enclosed in cylindrical sleeves as required for the single spindle machines, or provided with a guard or barrier in front and along the sides of the bits extending beyond the cutting end of the bits when they are in the withdrawn position.

Shears and Cutters

Par. 9248. All power shears and cutters shall be provided with guards to prevent the fingers and hands of the operator feeding or placing the material or stock from reaching the zone of travel of the cutting or shearing edge, or the machine shall be provided with both a starting device that requires the use of both hands of the operator and a non-repeat device which will prevent a second stroke of the knife or shear.

Miscellaneous Cutting Machinery

Par. 9249. All other cutting machinery shall be guarded as may be required by the Buildings Engineer to prevent injury to any person.

SECTION 925

ROLLING MACHINERY

Scope of Rolling Machinery

Par. 9250. The requirements of this Section shall apply to all stationary power driven machines used for the purpose of obtaining or applying a rolling operation on material, substance or object. Rolling machinery used for the purpose of shaping or forming heated metal are to be excepted.

Classification of Rolling Machinery

Par. 9251. For the purposes of this Code, rolls shall be classified according to the following:

1. Feed rolls.
2. Shaping rolls.
3. Calender rolls.
4. Winding drum rolls.
5. Grinding and crushing rolls.
6. Heated rolls.
7. Miscellaneous rolls.

General Requirements for Rolling Machinery

Par. 9252. The general requirements for all rolling machinery shall be the same as the general requirements for cutting machinery in Paragraph 9242, except that the guarding of points of operations of rolling machinery shall be according to the requirements of this Section.

Feed Rolls

Par. 9253. Feed rolls shall be completely enclosed, excepting such portions of the rolls necessary to admit the material or stock.

Shaping Rolls

Par. 9254. All shaping rolls and drawing dies on blocks shall be provided with a device that will automatically shut off the power in event the operator is caught in the material or stock being shaped.

Calender Rolls

Par. 9255. All calender rolls shall be provided with a guard or feeding device so arranged that the material and stock can be fed without permitting the fingers of the operator to be caught between the rolls; or the rolls shall be provided with some approved form of device so arranged that the rolls can be immediately stopped by the operator at the point of feeding by striking in any direction; or by some approved device that will stop the rolls when the fingers or hands of the operator approach the intake points of the rolls.

Where the hands of the operator cannot come in contact with rolls that are automatically fed or hopper fed, the requirements of this Paragraph need not apply.

Winding Drum Rolls

Par. 9256. Where winding drum rolls are not arranged to run outward, they shall be guarded.

Grinding and Crushing Rolls

Par. 9257. All grinding and crushing rolls shall be completely enclosed by the body of the machine and they shall be hopper fed. The hopper shall be arranged so that the operator's fingers cannot come in contact with the rolls.

Where the feeding point of hoppers is not guarded by elevation, it shall be guarded by a guard rail or barrier.

Heated Rolls

Par. 9258. All heated rolls shall be guarded against contact by the operator of the machine.

Miscellaneous Rolls

Par. 9259. All other rolling machinery shall be so guarded as may be required by the Buildings Engineer to prevent injury to any person.

SECTION 926

PRESSING AND STAMPING MACHINERY

Scope of Pressing and Stamping Machinery

Par. 9260. The requirements of this Section shall apply to all stationary hand and foot powered, and power driven machines, including hammers fitted with rams and dies for the purpose of cold metal blanking, trimming, drawing, punching or stamping. Hydraulic presses, plate shears and punches, bull-dozers, and hot metal presses and hammers are to be excepted from the requirements of this Section.

Classification of Pressing and Stamping Machinery

Par. 9261. For the purposes of this Code, pressing and stamping machinery shall be classified according to the method of feeding material or stock into the machine.

The classification of pressing and stamping machinery shall be:

1. Manually fed presses.
2. Semi-automatically fed presses.
3. Automatically fed presses.

General Requirements for Pressing and Stamping Machinery

Par. 9262. The general requirements for pressing and stamping machinery shall be the same as the general requirements for cutting machinery in Paragraph 9242, except that the guarding of points of operations of pressing and stamping machinery shall be according to the requirements of this Section.

All steam and air operated presses and hammers shall be provided with stop valves in the admission or supply, which must be closed during the repair of the hammer or while changing dies.

Manually Fed Presses

Par. 9263. Pressing and stamping machinery having manual feed shall have the point of operation guarded as follows:

No guarding required when both hands of the operator are required to handle the stock or material which is of such shape and size that it is impossible for the hands holding or feeding the stock or material to come under the ram.

By a fixed guard or enclosure entirely surrounding the bottom portion of ram to a height beyond the maximum travel of the ram, and so arranged that the fingers or hands of the operator cannot come under the ram while feeding the stock or material.

By limiting the maximum distance traveled by the ram to three-eights of an inch.

By a tripping device requiring simultaneous action of both hands of the operator.

By a gate guard operated by the tripping device of the machine which interposes a barrier in front of the ram before the ram descends and will not permit the machine to operate until the hands of the operator have been removed to a safe distance.

By a sweep guard which will throw the operator's hands out of the danger zone as the ram descends. If the sweep guard is not directly connected to the ram, a non-repeat device or attachment shall be provided by which the tipping or operating means of the machine is disconnected after each stroke of the ram, and a positive stop introduced to stop the machine.

By the use of approved hand tools that permit the easy handling of the stock or material without requiring the operator to place his fingers or hands in the zone of travel of the ram.

Semi-Automatically Fed Presses

Par. 9264. Pressing and stamping machinery having semiautomatic feed such as chute feed, slide feed, sliding dies, dial feed, and revolving dies, shall be guarded at the points of operation by a ram enclosure, by limiting the stroke of the ram, or by a gate guard, all meeting the requirements covering manually fed presses in Paragraph 9263.

Automatically Fed Presses

Par. 9265. In pressing and stamping machinery having automatic feed such as roll feed, push or pull feed, and plunger feed, the required safeguarding of points of operation shall be the same as those required for semi-automatically fed machinery in Paragraph 9264.

Miscellaneous Requirements for Pressing and Stamping Machinery

Par. 9266. All foot operated power pressing and stamping machines shall have the tripping treadle substantially guarded, or located within the frame of the machine to prevent accidental tripping.

Hand operated power pressing and stamping machines shall be provided with a spring latch on the lever to prevent accidental or premature tripping.

Each hand operated power pressing or stamping machine, if attended by more than one person, shall have an interlocking lever or similar device in addition to the main tripping device, to prevent accidental or premature tripping.

If the nature of the operation or the kind of material or stock used is such as to create a hazard from flying particles, additional guarding shall be provided to protect against the flying particles.

SECTION 927

ABRASIVE MACHINERY

Scope of Abrasive Machinery

Par. 9270. The requirements of this Section shall apply to all stationary and portable power driven machines using abrasive wheels for the purpose of obtaining or applying an abrasive operation on material, substance or object. Abrasive wheels consisting of grindstones, or metal, wooden, leather or cloth wheels having abrasive surfaces are not to be included.

General Requirements for Abrasive Machinery

Par. 9271. The requirements for the control, supports and guarding moving parts, other than abrasive wheels, of abrasive machinery shall be the same as the requirements for cutting machinery in Paragraph 9242.

The requirements of this Section applying to the protection and safeguarding of abrasive wheels shall not apply to wheels whose greatest diameter is less than 6 inches. If a hazardous condition exists in any abrasive wheel less than 6 inches in diameter, then the requirements shall apply.

All abrasive wheels shall be provided with at least one of the following forms of protection:

With protection hoods for wheels having straight sides perpendicular to the spindle, conforming to the requirements of Paragraph 9272.

With protection flanges when the wheel is tapered at least three-fourths of an inch per foot on each side, conforming to the requirements of Paragraph 9275.

With protection bands or chucks where the wheel is of such shape that it is impracticable to use protection hoods, conforming to the requirements of Paragraphs 9273 and 9274.

All abrasive wheels, except those mounted in chucks, shall be provided with driving flanges complying to the requirements in Paragraph 9275. Where the wheel is tapered and not provided with protection hoods or bands, the driving flanges shall be protection flanges.

Tapered abrasive wheels shall be provided on each tapered side with a flat spot or hub at the center having a diameter not more than that given in Table 3 of Paragraph 9275.

Protection Hoods

Par. 9272. Protection hoods shall be substantially built and of sufficient strength to retain fragments in event the wheel bursts.

Protection hoods shall be constructed of cast members of cast iron, cast steel, aluminum or other approved metal, or fabricated members of steel or wrought iron.

Protection hoods shall fully enclose the wheel, spindle end, flange, and nut projections, except the exposed portion of the wheel used for abrasion.

The angular exposure of the periphery and sides of abrasive wheels shall be that given in the following table:

TABLE 9272T

	Max. Angular Exposure of Periphery and Sides of Wheels	Max. Upper Point of Exposure above Horizontal Plane of Spindle	Max. Lower Point of Exposure below Horizontal Plane of Spindle
	Degrees	Degrees	Degrees
General Purpose Floor and Bench Machines	90	65	25 (Note 1)
Cylindrical Abrasion..	180	65	
Surface Abrasion......	150	(Note 2)	(Note 2)
Swing Frame Machines	180	(Note 2)	(Note 2)
Portable Machines	180	(Note 2)	(Note 2)
Top Abrasion.........	120	(Note 3)	(Note 3)

Note 1: When nature of work requires contact with wheel below horizontal plane of wheel spindle, this value may be increased to 60 degrees.

Note 2: Lower portion of wheel to be exposed symmetrically with respect to the vertical plane of wheel spindle.

Note 3: Upper portion of wheel to be exposed symmetrically with respect to the vertical plane of wheel spindle.

All protective hoods shall be provided with some approved form of adjustment to maintain the required angular exposure as given in Table 1, with the decrease in diameter of the wheel due to wear.

Protection Bands

Par. 9273. Protection bands provided for cup, cylindrical, and sectional ring abrasive wheels shall surround the wheel. Not more than one-quarter of the height of such wheels shall protrude beyond the protection band, but where the rim is more than 8 inches the wheel shall not protrude more than 2 inches.

Protection bands shall be made of wrought iron or steel plate and shall be substantial in construction. They shall be continuous and conform to the periphery of the surrounded portion of the wheel, and inner surface of band shall be free from projections.

Protection Chucks

Par. 9274. Protection chucks provided for cup, cylinder, and sectional ring abrasive wheels shall be so designed that the jaws will protect the wheel so that not more than one-quarter of such wheels will protrude beyond the protection chuck, nor protrude beyond the protection chuck more than one inch where the rim of the wheel is less than 2 inches thick, or protrude more than 2 inches where the rim is more than 2 inches thick.

Flanges

Par. 9275. Two driving flanges shall be provided with the abrasive wheel, and both flanges shall be of the same diameter.

The inner driving flange shall be keyed, screwed, shrunk or pressed onto the spindle. The outer flange shall have a neat fit on the spindle.

Each driving flange shall be recessed at the center at least one-thirty-second inch. The recess shall be on the side next to the wheel, and shall be of a diameter to give a bearing surface having a radial width not less than that given in Table 9275T1.

The dimensions contained in Table 9275T1 shall apply to all driving flanges used with abrasive wheels having straight sides and provided with protection hoods and bands.

TABLE 9275T1

Dimensions in Inches of Driving Flanges for Straight Wheels				
Diameter of Wheel	Minimum Outside Diameter of Flange	Minimum Radial Width of Bearing Surface	Minimum Thickness of Flange at Bore	Minimum Thickness of Flange at Edge of Recess
6	2	¼	⅜	3/16
8	3	¼	⅜	3/16
10	3½	5/16	⅜	¼
12	4	5/16	½	5/16
14	4½	⅜	½	5/16
16	5½	½	½	5/16
18	6	½	⅝	⅜
20	7	⅝	⅝	⅜
22	7½	⅝	⅝	7/16
24	8	¾	⅝	7/16
26	8½	¾	⅝	½
28	10	⅞	¾	½
30	10	⅞	¾	⅝
36	12	1	⅞	¾

Driving flanges used as protection flanges with tapered abrasive wheels shall have the same degree of taper as the wheel. The degree of taper shall not be less than three-fourths inch per foot for each flange, and the diameter of the flat area at center shall not be more than that given in Table 9275T2.

The dimensions contained in Table 9275T2 shall apply to all protection flanges used with tapered abrasive wheels where no protection hoods or bands are used.

TABLE 9275T2

Dimensions of Protection Flanges in Inches						
Diameter of Wheel	Minimum Outside Diameter of Flange	Minimum Radial Width of Bearing Surface	Minimum Thickness of Flange at Bore	Minimum Thickness of Flange at Edge of Recess	Maximum Diameter of Flat Spot at Center of Flange	Maximum Diameter of Flat Spot at Center of Wheel
6	3	¼	⅜	3/16	0	1
8	4	5/16	⅜	¼	0	1
10	5	½	½	¼	0	2
12	6	½	⅝	5/16	4	4½
14	8	⅝	⅝	⅜	4	4½
16	10	¾	⅝	⅜	4	6
18	12	1	¾	½	4	6
20	14	1¼	¾	½	4	6
22	16	1⅜	¾	9/16	4	6
24	18	1½	¾	9/16	4	6
26	20	1½	¾	⅝	4	6
28	22	1¾	⅞	⅝	4	6
30	24	2	⅞	¾	4	6
36	28	2	1	⅞	4	6

Tapered flanges used with tapered abrasive wheels that are provided with protection hoods may conform to the dimensions for straight flanges in Table 9275T1.

All driving or straight flanges shall be made of cast iron or other material of at least equal strength.

All tapered protection flanges up to and including 10 inches in diameter shall be made of cast iron or other material of at least equal strength; flanges having a diameter greater than 10 inches shall be made of steel or material of at least equal strength.

Work Rests

Par. 9276. Work rests shall be rigid in construction and shall be kept adjusted as close to the wheel as the work being done will permit.

Dust Removal for Abrasive Machinery

Par. 9277. All abrasive machinery, except wet grinders, operated continuously shall be provided with dust removal systems.

Other abrasive machinery not operated continuously, but which creates dust or flyings that are either hazardous or injurious shall also be provided with dust removal systems.

The regulations in this Paragraph do not apply to portable or semi-portable abrasive machinery.

Dust removal systems shall comply with the requirements of Section 956.

Miscellaneous Requirements for Abrasive Machinery

Par. 9278. All abrasive wheels, except those mounted in chucks, shall fit snugly on the spindle, and bushings, if used, shall not project beyond the sides of the wheel.

Spindle ends shall be so threaded that the units will tend to tighten as the spindle revolves. All nuts shall have a full bearing on the spindle.

Washers or flange facings of compressible material shall be fitted between the wheel and its flanges. The diameter of the washers shall not be smaller than the diameter of the flanges.

All surfaces of wheels, washers and flanges in contact with each other shall be free from dirt.

Abrasive wheels out of true through wear which cannot be trued by dressing shall be removed from the machine.

SECTION 928

MISCELLANEOUS MACHINERY

Scope of Miscellaneous Machinery

Par. 9280. The requirements of this Section shall apply to those stationary power driven machines whose operations on material, substance or objects cannot be classified as cutting, rolling, pressing and stamping, or abrasive.

General Requirements for Miscellaneous Machinery

Par. 9281. The general requirements for miscellaneous machinery shall be the same as the general requirements for cutting machinery in Paragraph 9242, except that the guarding of points of operations of miscellaneous machinery shall be according to the applicable requirements of this Section.

Centrifugal Machinery

Par. 9282. All centrifugal extractors shall be provided with covers for the revolving drums or baskets. These covers shall be arranged so that they must be closed at all times while the drums are in motion.

Centrifugal extractors shall be provided with effective brakes which are mechanically operated.

Staying Machinery

Par. 9283. Staying machinery shall have an automatic feeding device that requires the operator's attention only when recharging, or shall be provided with some form of device that will either stop the downward motion of the plunger when the operator's fingers come between the plunger and anvil, or prevent the fingers from entering the zone traveled by the plunger.

Mixing Machinery

Par. 9284. Mixing machines of the non-tilting type shall be provided with an interlocking device and cover so arranged that power cannot be applied to the agitator unless the cover is within 3 inches of complete closure.

Mixing machines of the tilting type shall either be provided with an interlocking device and cover so arranged that power cannot be applied to the agitator unless the cover is within 3 inches of complete closure, or provided with an automatic power cut-off in event the bowl is tilted more than 3 inches from full closure. With the latter provision, the bowl shall also be provided with a substantial cover to give complete closure in the mixing position.

Tumbling Machinery

Par. 9285. Tumbling machinery shall be provided with a device so arranged in connection with the opening in the tumbling barrel and the driving mechanism as to prevent the barrell from moving while the door is open.

Tumbling barrels exposed to contact shall be guarded.

Sewing Machinery

Par. 9286. Power driven single needle sewing machines used for straight sewing without folders shall be provided with a needle guard to prevent the operator's fingers from passing under the needle.

Bottling Machinery

Par. 9287. Pressure bottling machinery, both foot powered and power driven, shall be provided with a solid sheet metal guard at a location where the bottle is being filled, so arranged as to prevent flying glass in any direction in event the bottle bursts.

The guard shall extend from a point below the base of the bottle to a point at least 4 inches higher than the top of the bottle.

The guards shall be made of not less than No. 18 U. S. Standard Gauge sheet metal, except where the bottling pressure exceeds 75 pounds, then the guards shall be made of not less than No. 12 U. S. Standard Gauge sheet metal.

Printing Machinery

Par. 9288. Platen printing presses, both foot powered and power driven, shall be guarded at point of operation as follows:

By an automatic feeding device which does not require the operator's hands to be placed between the platen and bed.

By an automatic stop which will prevent the platen from closing if the operator's hands are between it and the bed.

By a gate or sweep guard which will either keep out or remove the operator's hands from under the platen while in motion.

Printing machinery having rolls requiring attendance of an operator shall be guarded where exposed to contact according to the requirements of Paragraph 9255.

Other Miscellaneous Machinery

Par. 9289. Other miscellaneous machinery shall be so constructed and guarded, as may be required by the Buildings Engineer to prevent injury to any person.

SECTION 929

GUARDS

Classification of Guards

Par. 9290. For the purposes of this Code, guards shall be classified as:

1. Standard guards.
2. Disk guards.
3. Shield guards.
4. "U" guards.
5. Wood guards.
6. Horizontal overhead belt, rope and chain guards.
7. Guard rails.
8. Toe boards.

General Requirements for Guards

Par. 9291. Wherever guards or guarding is called for, the guards shall be in accordance with this Section.

All guards shall be constructed of metal and supported by metal members, except wood guards, which may only be used under certain conditions, as set forth in Paragraph 9296.

All guards shall be designed so as not to interfere with the usual machine operations, but shall give the maximum protection to the person or persons.

Where it is necessary to change belts, make adjustments, or for the admission of oil or grease, guards shall be provided with either hinged or removable sections. The hinged or removable sections shall have the same strength and afford the same protection as the guard proper of which they are an integral part.

Where guards are exposed to unusual wear or deterioration, heavier material than the minimum requirements of this Section shall be used to the satisfaction of the Buildings Engineer.

Guards shall be kept securely fastened in place, and maintained in good repair at all times.

Where guards are supported from ceiling rafters or overhead floor beams, suitable reinforcement to the supporting structure shall be provided, where such is necessary, to sustain safely the stress imposed by the guard.

Materials for Standard Guards

Par. 9292. Standard guards shall consist of any one of the following materials: Expanded metal, perforated or solid sheet metal, or wire mesh fastened on a framework of angle iron or iron pipe, and securely fastened to floor, wall or frame of machine.

All metal shall be free from burrs and sharp edges.

Wire mesh shall be of the type in which the wires are securely fastened at every cross point either by welding, soldering, or galvanizing, except in the case of diamond or square wire mesh made of No. 14 U. S. Standard Gauge wire, ¾ mesh, or heavier.

For all guards, except horizontal overhead belt, rope, cable or chain guards above floor, the dimensions and sizes of the required materials, and the minimum height of guard from floor, as depending on the clearance from moving parts at all points of the guard, the requirements contained in the following table shall apply:

TABLE 9292T

Material	Clearance from Moving Parts at All Points	Largest Mesh or Opening Allowable	Minimum Guage (U. S. Standard) or Thickness	Minimum Height of Guard
Woven Wire	Under 4 in. Over 4 in.	½ inch 2 inches	No. 16 No. 12	6 feet 5 feet
Expanded Metal	Under 4 in. Over 4 in.	½ inch 2 inches	No. 18 No. 13	6 feet 5 feet
Perforated Metal	Under 4 in. Over 4 in.	½ inch 2 inches	No. 20 No. 14	6 feet 5 feet
Sheet Metal	Under 4 in. Over 4 in.		No. 22 No. 22	6 feet 5 feet
Wood (See note) or Metal Strip Crossed	Under 4 in.	½ inch	Wood ¾ in. Metal No. 16	6 feet
	Over 4 in.	2 inches	Wood ¾ in. Metal No. 16	5 feet
Wood (See note) or Metal Strip Not Crossed	Under 4 in.	½ in. width	Wood ¾ in. Metal No. 16	6 feet
	Over 4 in.	1 in. width	Wood ¾ in. Metal No. 16	5 feet

Note: The use of wood as a material for guards is only permitted under certain conditions as contained in Paragraph 9296.

Construction of Standard Guards

Par. 9293. Expanded metal, sheet or perforated metal, and wire mesh shall be securely fastened to frame by one of the following methods:

With rivets or bolts spaced not more than 10 inches center to center. In case of expanded metal or wire mesh metal strips or clips shall be used to form a washer for the rivets or bolts.

By welding to frame every 8 inches.

By weaving through channel or angle frame, or if No. 14 U. S. Standard Gauge ¾-inch wire mesh or heavier is used by bending entirely around rod frames.

Where openings in pipe railing are to be filled in with expanded metal wire mesh, or sheet metal, the filler material shall be made into panels with rolled edges or bound with "V" or "U" edging of No. 24 U. S. Standard Gauge or heavier sheet metal fastened to the panels with bolts or rivets spaced not more than 10 inches center to center. The bound panels shall be fastened to the railing by sheet metal clips spaced not more than 10 inches center to center.

Diamond or square mesh made of crimped wire may be used as a filler for guards provided the mesh is fastened on iron or steel channel, angle or round-iron frames. The size of mesh shall comply with the dimensions given in table in Paragraph 9292.

The requirements for the framework of standard guards shall be as follows:

The framework of guards rigidly braced every 3 feet or fractional part thereof of their height to some fixed part of machinery or building shall consist of not smaller than 1 by 1 by ⅛ inch angle iron, ¾ inch inside diameter metal pipe, or approved metal construction of equivalent strength.

The framework of guards fastened to floor and without other support or bracing shall consist of not smaller than 1½ by 1½ by ⅛ inch angle iron, 1½ inches inside diameter metal pipe, or other approved metal construction of equivalent strength.

Guards 30 inches or less in height and with a total surface area not in excess of 10 square feet may have a framework of ⅜ inch solid rod, ¾ by ¾ by ½ inch angle or metal construction of equivalent strength.

Where the design and construction requires filler material of area greater than 12 square feet, additional frame members shall be provided to maintain the panel area within this limit.

Rectangular guards fastened to floor and without other support or bracing shall have at least four upright supporting members, and cylindrical guards under the same condition shall have at least three supporting members, all carried to the floor or working platform.

All joints of the framework to which the filler material is attached shall be made equivalent in strength to the material of the frame.

Disk Guards

Par. 9294. A disk guard shall consist of a sheet-metal disk not less than No. 22 U. S. Standard Gauge fastened by "U" bolts or rivets to spokes or center web of pulleys, fly wheels or gears where required.

Where possibility of contact with sharp edges of the disk exists, the edge shall be rolled or wired.

In all cases the nuts shall be provided with lock nuts which shall be placed on the unexposed side of the guard.

Shield Guards and "U" Guards

Par. 9295. A shield guard shall consist of a frame filled with wire mesh, expanded, perforated or solid sheet metal, meeting the requirements for dimensions and sizes as given in Paragraph 9292. The framework for shield guards shall be as required for standard guards in Paragraph 9293, except as permitted below.

If the area of the shield does not exceed 6 square feet, the wire mesh or expanded metal may be fastened in a framework of ⅜ inch solid rod, ¾ by ¾ by ⅛ inch angle or metal construction of equivalent strength.

Shield guards may have edges entirely rolled around a ⅜ inch solid rod.

"U" guards shall be constructed of materials specified in Paragraph 9292.

Edges of "U" guards shall be smooth and, if size of guard requires, these edges shall be reinforced by rolling, wiring, or by binding with angle or flat strips.

Wood Guards

Par. 9296. Wood guards may be used in woodworking and chemical industries and in industries where the presence of fumes or where manufacturing conditions would cause the rapid deterioration of metal guards.

Wood guards may also be used in construction work and in locations outdoors where the extreme cold and extreme heat make metal guards undesirable.

In all other industries, wood guards are prohibited except by special permission of the Buildings Engineer.

The wood used in guards shall be sound, tough, and free from loose knots, and shall be of planed lumber not less than one inch rough board measure, and have edges and corners rounded off.

Wood guards shall be securely fastened together with wood screws, hardwood dowel pins, bolts or screws.

The dimensions as given in table under Paragraph 9292, applying to the use of wood as a material for guards, shall be followed.

The sizes and dimensions of filler and framework materials for wood guards shall be such that the guard shall be equal in strength and rigidity to metal guards as specified under Paragraph 9293.

For the construction of standard wood railings, the requirements in Paragraph 9298 shall apply.

Horizontal Overhead Belt, Rope and Chain Guards

Par. 9297. Horizontal overhead belt, rope and chain guards shall run the entire length of the belt, rope or chain and follow the line of the pulley, sheaves or sprockets to the ceiling or be carried to the nearest wall, effectively enclosing the belt, rope or chain. Where belts, ropes or chains are so located as to make it impracticable to carry the guard to wall or ceiling, the guard shall be constructed to enclose completely the top and bottom runs of belt, rope or chain and the face of pulleys, sheaves or sprockets.

The interior surfaces of guards which the belt, rope or chain would come in contact with shall be smooth and free of projections.

Overhead belt, rope and chain guards shall be at least one-quarter wider than the belt, rope or chain which they protect, but the side clearance between the guard and drive shall not be less than 2 inches or exceed 6 inches on each side. In chain drives where the chain is held from lateral displacement on the sprockets the minimum side clearance between the drive and guard may be one inch.

Guards for overhead belt, rope and chain drives 10 inches or more in width shall be constructed according to the requirements in Table 9297T. For drives less than 10 inches in width, the requirements in this table for width of drives 10 to 14 inches shall apply, with the exception that for belts less than 10 inches wide, the filler material may be No. 20 U. S. Standard Gauge sheet metal.

Expanded metal shall not be used as a filler material in horizontal overhead belt and rope guards.

In overhead rope and chain guards, a side guard member of solid filler material shall be carried up in a vertical position 2 inches above the level of the lower run of the rope or chain drive and 2 inches within the periphery of the pulleys, sheaves or sprockets which the guard encloses, thus forming a trough. These side members shall be reinforced on the edges with one and one-half inch by one-quarter inch flat steel strip, riveted to the filler material at not more than 8 inch centers; the reinforcing strip shall be fastened to all guard supporting members.

The clearances between overhead belt, rope and chain guards and the outer face of the drive shall be that as given in Table 9297T.

The following table of materials and dimensions, shall apply to the construction of horizontal overhead belt, rope and chain guards.

TABLE 9297T

Members	Width			Material
	Over 10" to 14" incl.	Over 14" to 24" incl.	Over 24"	
Framework	1½" x 1½" x ¼"	2" x 2" x 5/16"	3" x 3" x 3/8"	Angle Iron
Filler (belt guards)	1½" x 3/16"	2" x 3/16"	2" x 5/16"	Flat Iron
Filler and vertical side member	No. 20 A.W.G.	No. 18 A.W.G.	No. 18 A.W.G.	Solid Sh't. Metal
Filler supports	2" x 5/16" Flat Iron	2" x 3/8" Flat Iron	2½" x 2½" x ¼" ∠	Flat or Angle
Guard supports	2" x 5/16"	2" x 3/8"	2½" x 3/8"	Flat Iron
Fastenings				
Filler supports to framework	(2) 5/16"	(2) 3/8"	(3) ½"	Rivets
Filler flats to supports (belt guards)	(1) 5/16"	(1) 5/16"	(2) 3/8"	Flush rivets
Filler to frame and supports (rope and chain guards)	3/16" rivets spaced 8" c.-c. on sides & 4" c.-c. on bottom			
Guard supports to framework	(2) 3/8"	(2) 7/16"	(2) 5/8"	Rivets or bolts
Guard and supports to overhead ceiling	¼" x 3½" lag scr-s. or ½" Bolts	5/8" x 4" lag scr-s. or 5/8" Bolts	¾" x 6" lag scr-s. or ¾" Bolts	Lag screws or bolts
Details & Spacing				
Spacing between filler supports	20" c.-c.	16" c.-c.	16" c.-c.	
Spacing between filler flats (belt guards)	2" apart	2½" apart	3" apart	
Spacing between guard supports	36" c.-c.	36" c.-c.	36" c.-c.	
Other Belt Guard Filling Permitted				
Sheet metal fastened as in rope and chain guards	No. 20 A.W.G.	No. 18 A.W.G.	No. 18 A.W.G.	Solid or perforated
Woven wire, 2" mesh	No. 12 A.W.G.	No. 10 A.W.G.	No. 8 A.W.G.	

Clearance from Outside of Belt, Rope or Chain Drive to Guard

Distance center to center of shafts	Up to 15' incl.	Over 15' to 25' incl.	Over 25' to 40' incl.	Over 40'
Clearance from bottom and top of belt, rope, or chain to guard	6"	10"	15"	20"

NOTE: Figures in parentheses are the required number of the item.

Guard Rails and Toe Boards

Par. 9298. Guard rails shall be 42 inches in height, with a mid-rail between the top rail and floor.

The posts for guard rails shall be not more than 8 feet apart; they are to be permanent and substantial, smooth, and free from protruding rails, bolts and splinters.

The members of guard rails shall be as follows:

Pipe shall be not less than one-and-one-quarter inches inside diameter.

Metal shapes or bars shall be equal in strength to a one-and-one-half by one-and-one-half by three-sixteenths inch angle iron.

Wooden posts shall be 2 by 4 inches or larger; wooden upper rail shall be 2 by 4 inches, or two 1-by-4 inch strips, one at the top and one at the side of posts; and wooden mid-rails shall be 1 by 4 inches or more.

The rails shall be on that side of the posts which gives the best protection and support.

Where panels are fitted with expanded metal or wire mesh the mid-rails may be omitted. The expanded metal or wire mesh shall meet with the requirements of Section 9292.

The clearance between guard rails and moving parts of machinery shall be not less than 15 inches and not more than 20 inches.

Toe boards shall be 4 inches or more in height, of wood, metal, or of metal grill not exceeding one inch mesh. Toe boards shall be securely fastened to floor, rail posts, or both.

CHAPTER 93

BOILERS AND UNFIRED PRESSURE VESSELS

Sec. 930—General Regulations for Boilers and Unfired Pressure Vessels.
Sec. 931—Material Specifications for Boilers and Unfired Pressure Vessels.
Sec. 932—Design and Construction of Power Boilers.
Sec. 933—Design and Construction of Low-Pressure Heating Boilers.
Sec. 934—Design and Construction of Miniature Boilers.
Sec. 935—Design and Construction of Unfired Pressure Vessels.
Sec. 937—Inspections of Installed Boilers and Unfired Pressure Vessels.
Sec. 938—Non-Conforming Boilers and Unfired Pressure Vessels.
Sec. 939—Maintenance and Operation of Boilers and Unfired Pressure Vessels.

SECTION 930

GENERAL REGULATIONS FOR BOILERS AND UNFIRED PRESSURE VESSELS

Scope of Regulations for Boilers and Unfired Pressure Vessels

Par. 9300. This Chapter covers the design, construction, installation, inspection, testing, maintenance and operation of power boilers, low-pressure heating boilers, miniature boilers and unfired pressure vessels. Provided, however, that the provisions of Chapter 93 of this Code shall not apply to any of the matters or things over which the Division of Smoke Control in the Bureau of Mechanical-Electrical Service and the Advisory and Appeal Board as created and established by Ordinance No. 1296, approved May 13, 1931, and all amendments thereto, jointly or severally, now have jurisdiction, power or authority.

The several American Society of Mechanical Engineers Boiler Codes to which references are made hereinafter are identified by the dates of their respective editions; such references, however, shall in every case mean the Code of the edition noted together with such amendments thereto as have been made by the American Society of Mechanical Engineers prior to the passage of this Code.

Classification of Boilers

Par. 9301. Boilers shall be classified as follows:

Power Boilers
Low-Pressure Heating Boilers
Miniature Boilers

Classification of Unfired Pressure Vessels

Par. 9302. Unfired pressure vessels shall be classified as follows:

Vessels subjected to Internal Pressure
Vessels subjected to External Pressure
Containers for Gases and Liquids at Temperatures from —10 to —150 Degrees Fahrenheit.

Applications, Permits and Certificates for Boilers and Unfired Pressure Vessels

Par. 9303. All applications, permits and certificates for the installation of boilers and unfired pressure vessels shall be in accordance with Part I.

Furnaces, Smokepipes and Chimneys for Boilers

Par. 9304. For regulations governing the design and construction of boiler-furnaces and smokepipes, refer to Chapter 94. Regulations governing the design and construction of free-standing and guyed chimneys are in Section 497, while those governing chimneys which are accessory to a building by being in the interior thereof, or by forming a part of, or being attached to, its walls will be found in Section 784.

SECTION 931

MATERIAL SPECIFICATIONS FOR BOILERS AND UNFIRED PRESSURE VESSELS

Material Specifications for Boilers and Unfired Pressure Vessels

Par. 9310. Materials used in the construction of boilers and unfired pressure vessels shall conform to Material Specifications in Section II of the American Society of Mechanical Engineers Boiler Construction Code, 1937 Edition.

SECTION 932

DESIGN AND CONSTRUCTION OF POWER BOILERS

Scope of Power Boilers

Par. 9320. This Section covers power boilers to be used in stationary service. Stationary service as herein considered includes portable and tractor boilers.

A fired steam boiler shall be deemed to mean a pressure vessel in which steam is generated by the application of heat resulting from the combustion of solid, liquid or gaseous fuel.

An unfired steam boiler shall be deemed to mean an unfired pressure vessel which generates steam for power or heat to be used externally to itself. Such vessels may also be constructed under the appropriate classification of Unfired Pressure Vessels, Section 935, in which case they shall be equipped with the safety devices required by the Power Boiler Code referred to in Paragraph 9323 in so far as they are applicable to the service of the particular installation.

The materials for forced-circulation boilers and boilers with no fixed steam or water line shall conform to the requirements of the American Society of Mechanical Engineers Power Boiler Code, 1937. All other requirements shall also be met except where they relate to special features of construction made necessary in boilers of these types, and to accessories that are manifestly not needed or used in connection with such boilers, such as water gages, water columns, and gage cocks.

These regulations apply to the boiler proper and pipe connections up to and including the valve or valves as required by the American Society of Mechanical Engineers Power Boiler Code, 1937. Superheaters, reheaters, economizers, and other pressure parts connected directly to the boiler without intervening valves shall be considered as parts of the boiler and their construction shall conform to the requirements of this Code.

Space Around Power Boilers

Par. 9321. Power boilers, except as noted below, shall be so located that no wood or other combustible material shall be less than 3 feet from the top or sides or 5 feet from the front of such boiler and all combustible material less than 5 feet from the top or sides and less than 10 feet from the front shall be protected with at least 4 inches of concrete, brick, a double metal shield or other incombustible material equally valuable as a heat insulator.

Gas fired and gas designed power boilers, built with combustion chamber as an integral part of the boiler shall be so located that the distance to wood or other combustible material shall not be less than two feet from the top or vertical surfaces of the boiler proper, except on the front where it shall not be less than 4 feet. All combustible material less than 4 feet from the top or any vertical surface of the boiler shall be protected by shields as described in Paragraph 9484.

Steel, cast iron or concrete columns supporting walls of any kind adjacent to such boilers shall not be in direct contact with furnace settings, but there shall be an open and unobstructed space between column and setting, which in no case shall be less than 4 inches or less than one-half the width of the column.

Supports for Power Boilers

Par. 9322. Power boilers shall be supported on incombustible construction designed to meet the requirements of Part VI and VII. Provisions shall be made for any expansion or contraction due to temperature changes caused by the boiler in any part of the supporting structure.

All floors and structural members of the building near the boiler shall be so insulated and ventilated that the temperature of any part thereof will at no time exceed 200 degrees Fahrenheit.

If the boiler is independently supported on structural steel work, the steel supporting members shall be so located or insulated and ventilated that heat from the furnace will not raise the temperature of such steel work beyond 650 degrees Fahrenheit.

Construction of Power Boilers

Par. 9323. The construction of power boilers, including fittings and appliances, setting, testing and stamping, shall be in accordance with Section I of the American Society of Mechanical Engineers Boiler Construction Code, Rules for Construction of Power Boilers, 1937 Edition.

Each boiler installed in the City of Baltimore shall be stamped with the official symbol, or accompanied by a certificate from its manufacturer, to denote the American Society of Mechanical Engineers' Standard.

Installation of Power Boilers

Par. 9324. The setting brickwork for power boilers shall be of Grade A clay or shale brick, as specified in Section 611, laid in a thoroughly mixed mortar composed of one volume of

Portland cement, 3 volumes of unslaked lime, and 16 volumes of clean sharp sand. Every brick shall be thoroughly imbedded and each joint filled. All such brickwork shall be protected from heat by first-grade fire brick.

Power boilers exceeding 5 H. P. capacity, unless installed in furnace rooms constructed as required in Part IV, shall be placed in enclosures as follows:

a. If coal fired, except in industrial buildings, in 4-hour fire-resistive enclosures with all interior openings protected by Class B fire doors.

b. If oil or gas fired, except in storage and industrial buildings, in 3-hour fire-resistive enclosures with all interior openings protected by Class B fire doors.

SECTION 933

DESIGN AND CONSTRUCTION OF LOW-PRESSURE HEATING BOILERS

General Regulations for Low-Pressure Heating Boilers

Par. 9330. Section 933 covers boilers to be used exclusively for low-pressure steam heating, hot-water heating and hot-water supply. It does not apply to economizers or feedwater heaters. The rules do not cover apparatus such as domestic heating plants, ordinary range water backs, range tank and gas water heaters for the production of domestic hot-water supply, which are regulated in Chapter 94.

Low-pressure heating boilers shall include steel plate and cast iron boilers and the regulations apply to all steam boilers for operation at pressures not exceeding 15 pounds per square inch. For conditions exceeding the foregoing cast iron boilers shall not be used, and steel plate boilers shall be constructed and set as required for power boilers.

Space Around Low-Pressure Heating Boilers

Par. 9332. Low pressure heating boilers shall be so located that no combustible construction will be within 4 feet from the front and less than 2 feet from the top, sides and rear, except when the appliance is encased in brick or has incombustible insulating covering not less than one inch thick, such distances may be not less than 1 foot at the top, sides and rear.

Supports for Low-Pressure Heating Boilers

Par. 9333. Except as otherwise herein permitted, low-pressure heating boilers, using solid, liquid or gaseous fuel, shall be set upon substantial supports of incombustible and heat-resistive materials.

Boilers having grate or burner areas less than 3 square feet may be set upon wooden floors, provided such boilers rest upon pedestals consisting of at least a 2-inch layer of solid brick and a 4-inch layer of hollow tile, or the equivalent of these two materials, set on a sheet metal plate at least as thick as No. 14 U. S. Gauge and at least 24 inches larger in all directions than the base of the boiler, if solid fuel is used, and 6 inches larger in all directions if liquid or gaseous fuel is used. Such tile shall be laid with open ends in contact. When solid fuel is used, an ash plate or ash pan of metal at least as thick as No. 10 U. S. gauge shall be provided above the pedestal. Such boilers with water cooled bases may rest directly on sheet metal bases without any intervening masonry, provided the sheet metal is at least as thick as No. 14 U. S. Gauge.

Boilers in which the floor of the combustion chamber rests directly upon reinforced concrete or structural metal, shall have a heat-resistive pedestal, with ventilation and insulation if necessary.

Under boilers supported upon waterproofed basement or cellar floors, there shall be installed insulation equivalent to that required for a wooden floor, to protect the water-proofing against damage from heat.

Construction and Installation of Low-Pressure Heating Boilers

Par. 9334. The construction of low-pressure heating boilers, including setting and installation requirements, fittings and appliances, hydrostatic tests and fusion-welded boilers, shall be in accordance with Section IV of the American Society of Mechanical Engineers Boiler Construction Code, Rules for Construction of Low-Pressure Heating Boilers, 1935 Edition.

Each boiler installed in the City of Baltimore shall be stamped with the official symbol, or accompanied by a certificate from its manufacturer, to denote the American Society of Mechanical Engineers Standard.

SECTION 934

DESIGN AND CONSTRUCTION OF MINIATURE BOILERS

Scope of Miniature Boilers

Par. 9340. This Section covers boilers which embrace fired pressure vessels which do not exceed the following limits:

16 inches inside diameter of shell.
42 inches over-all length of outside to outside of heads at center.
20 square feet water heating surface.
100 pounds per square inch maximum allowable working pressure.

Where any one of the foregoing limits is exceeded, the rules for power boilers shall apply.

For forced-circulation boilers and boilers with no fixed steam or water line, the materials used shall comply with the Boiler Code, cited in Paragraph 9323. All other Boiler Code requirements shall be met except where they relate to special features of construction made necessary in boilers of this type and to accessories that are manifestly not needed or used in connection with such boilers, such as water gauges, water columns and gauge cocks.

Space Around Miniature Boilers

Par. 9341. The space around miniature boilers shall be in accordance with the requirements of Paragraph 9332.

Supports for Miniature Boilers

Par. 9342. Miniature boilers installed over combustible floors or other combustible construction shall be supported by one of the following methods:

a. Where the burner is at least 18 inches from the floor or other construction, on substantial metal legs.

b. Where the burner is less than 18 inches but more than 6 inches from the floor, on substantial metal legs with a metal plate midway between the floor and the burner, extending at least 6 inches beyond the boiler on all sides.

c. Where the burner is 6 inches or less from the floor, on three steel plates, each at least one-eighth inch thick with an air space of at least 3 inches below the top plate and an air space of at least one inch below the middle plate; or on a metal plate at least one-eighth inch thick on a layer of solid brick not less than two and one quarter inches thick resting on hollow clay tile not less than 4 inches thick.

Construction of Miniature Boilers

Par. 9343. The construction of miniature boilers including fittings and appliances, and hydrostatic and hammer tests for welded construction shall be in accordance with Section V of the American Society of Mechanical Engineers Boiler Construction Code, Rules for Construction of Miniature Boilers, 1935 Edition.

Each boiler installed in the City of Baltimore shall be stamped with the official symbol or accompanied by a certificate from its manufacturer, to denote the American Society of Mechanical Engineers Standard.

Installation of Miniature Boilers

Par. 9344. Every miniature boiler shall be protected by asbestos or equivalent insulation at least one inch thick.

They shall not be installed under stairs, in stair or elevator shafts, passageways, hallways, or in any other means of egress.

SECTION 935

DESIGN AND CONSTRUCTION OF UNFIRED PRESSURE VESSELS

Scope of Unfired Pressure Vessels

Par. 9350. This Section covers unfired pressure vessels herein specified in which both $(P-15)(D-4)$ is greater than 60 and $(P-15)(V-1.5)$ is greater than 22.5 where

P = pressure in pounds per square inch.
D = inside diameter of vessel in inches.
V = volume in cubic feet.

When the interior chamber of a jacketed vessel is open and not subject to pressure, the factor V applies only to the jacket. When both the interior chamber and the jacket are subject to pressure, the factor V applies to the entire volume of the vessel.

These exemptions apply to each single vessel and not to an assembly of vessels.

This Section is not intended to apply to

a. Pressure vessels which are subject to Federal control.

b. Locomotives of all types.

c. Vessels for containing only water or water and air under pressure for domestic supply, the air serving only as a cushion or as an air-lift in pumping systems.

d. Vessels for flammable liquids or gases, or both, at temperatures of over 300 degrees Fahrenheit.

e. Vessels subject to collapsing pressures of 15 pounds per square inch or less.

For regulations governing the design and construction of tanks used for storing or handling liquids and gases, refer to Chapter 97.

General Regulations for Unfired Pressure Vessels

Par. 9351. An unfired boiler which generates steam for power or heat to be used externally to itself shall be constructed in accordance with Section 932 or with this Section.

Protection of Unfired Pressure Vessels

Par. 9352. All pressure vessels shall be protected by such safety and relief valves and indicating and controlling devices as will insure their safe operation. These devices shall be so constructed, located and installed that they cannot readily be rendered inoperative. The relieving capacity of safety valves shall be such as to prevent a rise of pressure in the vessel of more than 10 per cent above the maximum allowable working pressure, and their discharges shall be carried to a safe place.

Unfired steam boilers shall be equipped with the safety devices required by the Power Boiler Code referred to in Paragraph 9323 insofar as they are applicable to the service of the particular installation.

Construction of Unfired Pressure Vessels

Par. 9353. The construction of unfired pressure vessels, including fittings and appliances, hydrostatic tests, inspections, stamping, fusion welding, forge welding, electric-resistance butt welding, brazing and enameled vessels shall be in accordance with Section VIII of the American Society of Mechanical Engineers Boiler Construction Code, Rules for Construction of Unfired Pressure Vessels, 1937 Edition or the A. P. I.-A. S. M. E. (American Petroleum Institute-American Society of Mechanical Engineers) code for unfired pressure vessels for petroleum liquids and gases, 1938 Edition, in so far as it is applicable.

Each unfired pressure vessel installed in the City of Baltimore shall be stamped with the official symbol or accompanied by a certificate from its manufacturer, to denote compliance with the above mentioned A. S. M. E. or A. P. I.-A. S. M. E. code whichever is applicable.

Vessels Subjected to External Pressure

Par. 9354. The construction of unfired pressure vessels subjected to external pressure shall also be in accordance with the special rules in Paragraphs U-120 to U-138 inclusive of Section VIII of the American Society of Mechanical Engineers Boiler Construction Code, Rules for Construction of Unfired Pressure Vessels, 1937 Edition, except that such special rules do not apply to vessels used in petroleum processing, and shall not be used for the determination of thickness of walls of tubes that are to be expanded, rolled or screwed into tube sheets.

Containers for Gases and Liquids at Temperatures from —10 to —150 Degrees Fahrenheit

Par. 9355. The construction, including safety devices, testing and stamping of containers for gases and liquids at temperatures from —10 to —150 degrees Fahrenheit shall be in accordance with the special rules in Paragraphs U-140 to U-144 inclusive of Section VIII of the American Society of Mechanical Engineers Boiler Construction Code, Rules for Construction of Unfired Pressure Vessels, 1937 Edition.

These special rules cover containers for non-corrosive gases and liquids, which have no deleterious effect on the steel of the vessel, which containers may be used for the liquefaction or gasification of solid carbon dioxide. They do not apply to temperatures below minus 150 degrees Fahrenheit nor for vessels designed for atmospheric or higher temperatures, nor do they apply to vessels in which thermal stresses imposed by the conditions of operation will be an important factor.

Installation of Unfired Pressure Vessels

Par. 9356. The installation of unfired pressure vessels is not hereby restricted, but shall conform to the requirements for Group T4 metal tanks in Chapter 97 which apply.

SECTION 937

INSPECTIONS OF INSTALLED BOILERS AND UNFIRED PRESSURE VESSELS

Inspection of Power Boilers

Par. 9371. The inspection of power boilers is under the jurisdiction of the Board of Boiler Rules created under the provisions of Chapter 718 of the Laws of Maryland, 1939.

No inspections, in addition to those required by the Board, need be made by the Buildings Engineer, except such inspections relative to the location and installation of power boilers which may not be made by the Board.

Inspection of Low-Pressure Heating Boilers

Par. 9372. Low-pressure heating boilers shall be inspected as to location upon completion of the installation thereof and no tests other than those required in Paragraph 9334 shall be required.

Inspection of Miniature Boilers

Par. 9373. The inspection of miniature boilers is under the jurisdiction of the Board of Boiler Rules created under the provisions of Chapter 718 of the Laws of Maryland, 1939.

No inspections, in addition to those required by such Board, need be made by the Buildings Engineer, except inspections relative to the location and installation of miniature boilers upon completion of the installation thereof.

Inspection of Unfired Pressure Vessels

Par. 9374. Unfired pressure vessels having a volume of over 5 cubic feet, except those containing water only, and all vessels with an internal pressure of more than 150 pounds per square inch shall be annually inspected by the Buildings Engineer or his authorized representative.

SECTION 938

NON-CONFORMING BOILERS AND UNFIRED PRESSURE VESSELS

Non-Conforming Power Boilers

Par. 9380. Any power boiler for which a certificate of inspection has not been issued or for which a certificate of inspection has been denied, shall not be installed or used in the City of Baltimore until and after proper certificate of inspection has been issued.

Power boilers, for which certificates of inspection have been issued, which do not conform in other respects with the requirements of Chapter 93, shall be made to conform thereto when renewals, changes or alterations are made to such boilers or to the plants of which such boilers form a part.

Non-Conforming Low-Pressure Heating Boilers

Par. 9381. Every low-pressure heating boiler which does not comply with the provisions of Chapter 93 shall be made to conform to the requirements of said Chapter 93, if such boiler or the plant of which such boiler forms a part is or creates a hazard to life or property, or when any renewal, change or alteration is made to such boiler or to the plant of which such boiler forms a part, regardless of which condition occurs first.

Non-Conforming Miniature Boilers

Par. 9382. Any miniature boiler for which a certificate of inspection has not been issued or for which a certificate of inspection has been denied, shall not be installed or used in the City of Baltimore until and after a proper certificate of inspection has been issued. Miniature boilers for which certificates of inspection have been issued, which do not conform in other respects with the requirements of Chapter 93 of this Code, shall be made to conform thereto when renewals, changes or alterations are made to such boilers.

Non-Conforming Unfired Pressure Vessels

Par. 9383. Every unfired pressure vessel which does not comply with the provisions of Chapter 93 shall be made to conform to the requirements of said Chapter 93 upon the service of notice from the Buildings Engineer to do so.

SECTION 939

MAINTENANCE AND OPERATION OF BOILERS AND UNFIRED PRESSURE VESSELS

Maintenance and Operation of Power Boilers

Par. 9390. No person shall use or operate any power boiler without first having received a certificate of inspection for such boiler, nor shall any person operate a power boiler without being duly licensed by the State of Maryland to do so. The provisions of this paragraph shall not apply to operators working under a licensed engineer in charge of such power boilers.

Maintenance and Operation of Low-Pressure Heating Boilers

Par. 9391. All low-pressure heating boilers shall be so maintained and operated that, at all times, they will meet the requirements of this Chapter and will not constitute any life or fire hazard.

Maintenance and Operation of Miniature Boilers

Par. 9392. All miniature boilers shall be so maintained and operated that, at all times, they will meet the requirements of this Chapter and will not constitute any life or fire hazard.

CHAPTER 94

FURNACES AND FUEL BURNING EQUIPMENT

Sec. 940—General Fuel Burning Regulations.
Sec. 941—Industrial Furnaces.
Sec. 942—Boiler Furnaces.
Sec. 943—Domestic Heating Plants.
Sec. 944—Solid Fuel Burning Systems.
Sec. 945—Oil Burning Systems.
Sec. 946—Gas Burning Systems.
Sec. 947—Miscellaneous Fuel Burning Appliances and Systems.
Sec. 948—Flues, Breeching, Shields, and Guards.

SECTION 940

GENERAL FUEL BURNING REGULATIONS

Scope of Furnace and Fuel Burning Regulations

Par. 9400. The design, construction, installation, alteration, repair, maintenance and operation of all furnaces and fuel burning systems used or intended to be used for the burning of fuel shall meet the requirements of Chapter 94 and other parts of this Code which apply. Provided, however, that the provisions of Chapter 94 of this Code shall not apply to any of the matters or things over which the Division of Smoke Control in the Bureau of Mechanical-Electrical Service and the Advisory and Appeal Board as created and established by Ordinance No. 1296, approved May 13, 1931, and all amendments thereto, jointly or severally, now have jurisdiction, power or authority.

Fuels

Par. 9401. Fuels shall include all combustible products commonly used to produce heat by burning in a furnace or by means of a specially designed burner or fuel burning system.

Every fuel shall conform to all the requirements for fuels in this Paragraph and shall be adapted to the furnace, burner or fuel burning system in which it is to be used.

Fuels shall be classified in accordance with their physical state as follows:

1. Solid fuels.
2. Liquid fuels.
3. Gaseous fuels.

In cases where there is doubt or disagreement as to the physical state of a fuel, the Bureau of Standards of the City of Baltimore shall determine its classification.

Solid Fuels shall include coal, coke, wood, and all similar combustible materials, including pulverized fuel, which exist in the solid state and which are usually handled by shovels, conveyors or other mechanical means. Coal and coke shall be tested if required by the Buildings Engineer in accordance with the requirements of the "Standard Methods of Laboratory Sampling and Analysis of Coal and Coke", of the American Society for Testing Materials, Serial Designation D271-37.

No solid fuel of a hazardous or explosive nature shall be used in any fuel burning system.

Liquid Fuels shall include fuel oils, petroleum, benzine, coal oil and all similar products which, due to their liquid state, are stored in tanks, drums or cans. Liquid fuels shall have a flash point of not less than 100 degrees Fahrenheit, as determined in accordance with the requirements of the "Standard Method of Test for Flash Point by means of the Pensky-Martins Closed Tester", of the American Society for Testing Materials, Serial Designation D93-36. Liquid fuel shall be free from acid, grit, fibrous or other foreign matter likely to clog or injure the burner or valves.

Gaseous Fuels shall include manufactured gas, natural gas, butane, propane, acetylene and all similar gases or mixture of gases commercially used for fuel. No use of gaseous fuel shall be approved by the Buildings Engineer which is a hazard to life or health. Required tests of gaseous fuels shall be by any standard method approved by the Bureau of Standards of the City of Baltimore.

Classification of Furnaces

Par. 9402. Furnaces shall be classified into 4 general classes:

1. Industrial furnaces.
2. Boiler furnaces:
    a. Power boiler furnaces.
    b. Heating boiler furnaces.
3. Domestic heating plants.
4. Miscellaneous fuel burning appliances.

Classification of Fuel Burning Systems

Par. 9403. Fuel burning systems, for the purpose of this Code, shall be divided into 3 classes, according to the physical nature of the fuel to be used, as follows:

1. Solid fuel burning systems.
2. Oil burning systems.
3. Gas burning systems.

Furnace Supports

Par. 9404. Independent furnaces or such connected to boilers, except domestic heating plants, shall be supported on incombustible construction designed to meet the requirements of Parts VI and VII. Provisions shall be made for any expansion or contraction due to temperature changes caused by the furnace in any part of the supporting structure.

Domestic heating plants shall be supported on reinforced concrete or masonry floors, on independent masonry supports, or on pedestals required in Paragraph 9433.

All floors and structural members of the building near the furnace shall be so insulated and ventilated that the temperature of any part thereof will at no time exceed 200 degrees Fahrenheit.

If the furnace is independently supported on structural steel work, the steel supporting members shall be so located or insulated and ventilated that heat from the furnace will not raise the temperature of such steel work beyond 650 degrees Fahrenheit.

Ash pits surrounded by water-bearing soil shall be waterproofed up to a level of at least 2 feet above the maximum probable ground water level. The waterproofing shall be protected by heat insulation such as diatomaceous earth or other approved insulating materials.

Ventilation Requirements for Furnace Rooms

Par. 9405. Adequate ventilation of furnace rooms shall be provided in order to assure proper combustion of the fuel.

Furnace rooms containing equipment using gas fuel and natural draft shall be provided with means for infiltration of external air with an effective area equal to at least the area of the flue. Such rooms containing furnaces burning oil or solid fuel with natural draft shall be provided with means for infiltration of external air with an effective area equal to at least three-fourths the area of the flue.

Fire Extinguishing Appliances for Fuel Burning Systems

Par. 9406. In the furnace room of every oil burning system with exposed tanks located inside the building, having a total capacity of 600-gallon or more, Class B portable fire extinguishers, which conform with the requirements of Chapter 98 and have the approval of the Buildings Engineer shall be provided.

The portable fire extinguishers shall have a capacity of one gallon for each 1000 gallons of oil, but never less than 2½ gallons.

Electrical Requirements for Fuel Burning Systems

Par. 9407. Electric controls, motors, wiring and all other electrical work in connection with every mechanical fuel burning system shall conform in every respect to the requirements of Part VIII.

Instructions for Fuel Burning Systems

Par. 9408. A card giving complete instructions in regard to the care and operation of every domestic automatic fuel burning system shall be permanently posted near the apparatus, and shall be maintained in legible condition.

Existing Furnace and Fuel Burning Systems

Par. 9409. Existing furnaces and fuel-burning systems which do not conform to the provisions of Chapter 94 of this Code shall be made to conform thereto when they are renewed or reconstructed or at any time if they create or tend to create an imminent hazard to life or property.

SECTION 941

INDUSTRIAL FURNACES

Scope of Industrial Furnaces

Par. 9410. Industrial furnaces shall include all chambers in which heat is used for the processing or changing of materials from one form to another.

Industrial furnaces shall comply with all applicable regulations of this Chapter.

Classification of Industrial Furnaces

Par. 9411. Industrial furnaces are divided into the following classes:

1. High temperature industrial furnaces having temperatures of 2000 degrees Fahrenheit and over, such as: blast furnaces, bessemer retorts, open hearth furnaces, ore roasting furnaces, and similar puddling furnaces, annealing furnaces, billet and bloom furnaces, cement brick and tile kilns, brass furnaces, coal and water gas retorts, cupolas, earthware kilns, glass smelting furnaces, porcelain baking and glazing kilns, welding furnaces.

2. Medium temperature industrial furnaces having temperatures from 1001 to 2000 degrees Fahrenheit, such as: wood carbonizing furnaces, fertilizer driers, pulp driers, feed driers, charcoal furnaces, gypsum kilns, galvanizing kilns, hardening furnaces, lime kilns, smoke houses, water glass kilns.

3. Low temperature industrial furnaces having temperatures of 1000 degrees Fahrenheit and less, such as: bakers ovens, boiling vats, candy furnaces, coffee roasting ovens, drying furnaces, forge furnaces, japanning ovens, lead smelting furnaces, rendering furnaces, rosin smelting furnaces, type foundry furnaces, wood drying and impregnating.

Design of Industrial Furnaces

Par. 9412. Industrial furnaces shall be designed and constructed in accordance with accepted engineering principles and shall be safe so as not to constitute a hazard to life or property.

Construction of Industrial Furnaces

Par. 9413. All refractory materials used in the construction of industrial furnaces shall conform to the requirements of the "Standard Specification for Clay Fire Bricks for Malleable Furnaces with Removable Bungs and for Annealing Ovens" of the American Society for Testing Materials, Serial Designation C63-39; and "Standard Specification for Clay Fire Brick for Stationary Boiler Service, of the American Society for Testing Materials, Serial Designation C64-39. Common bricks shall conform to the requirements of Paragraph 6111. Insulating refractory materials, ground refractory materials, high temperature resistive cement, and fire clay used in various mixtures may be substituted for refractory brick.

No industrial furnace shall have the exterior masonry walls less than 18 inches in thickness for the first 20 feet measured down from the top, and for every 15 feet increase in height, the thickness of the wall shall be increased 4 inches.

Installation of Industrial Furnaces

Par. 9414. Large coffee roasters, drying and baking ovens for lithographing on metal and japanning, kilns, and similar appliances in which fires are maintained, shall have sufficient clearance from any combustible construction and shall be protected as required by the Buildings Engineer, so as not to be or create a hazard to life or property.

Direct fired japanning and enameling drying ovens shall be designed to be supplied with the following amounts of fresh air, calculated at 70 degrees F., per gallon of thinner:

a. For box type ovens, 350 cubic feet per minute.

b. For conveyor type ovens, 9000 cubic feet.

SECTION 942

BOILER FURNACES

Scope of and General Regulations for Boiler Furnaces

Par. 9420. Boiler furnaces shall include all furnaces used with or which are an integral part of a boiler.

For boiler definitions and requirements, see Chapter 93.

Boiler furnaces shal conform with all applicable requirements of this Chapter.

Classification of Boiler Furnaces

Par. 9421. Boiler furnaces are classified into the following classes:

External furnaces.

Internal furnaces, such as furnaces of compact boilers, cast iron boilers, and locomotive fire boxes.

An external furnace is a furnace constructed independently of the boiler.

An internal furnace is a furnace self-contained within the boiler and which requires no separate enclosing structure.

External Furnaces for Boilers

Par. 9422. External furnaces burning solid fuel other than anthracite and equipped with mechanical underfeed stokers shall have a minimum setting height, which is the distance from the top of the retort to the crown sheet or tubes of the boiler, of not less than shown in Table 9422T.

TABLE 9422T

Rated Horsepower	Under 18	18 to 50	51 to 80	81 to 100	101 to 125	126 to 150	151 to 200	201 to 250
Height in Inches....	36	42	48	54	60	66	72	78

The minimum setting height for boilers with a rating of over 250 horsepower or equipped with mechanical stokers of other types shall be the preferred minimum setting height recommended by the Stoker Manufacturers' Association, provided such boilers are to be operated at not more than 150 per cent of the rated capacity.

When power boilers are to be operated at more than 150 per cent of rated capacity, the setting heights shall be increased to meet the requirements of the Buildings Engineer.

Furnaces for burning anthracite fuel shall be designed, constructed, installed and used in such a manner so as not to be or create a hazard to either life or property and such furnaces shall be approved by the Buildings Engineer before being installed or used.

Internal Furnaces for Boilers

Par. 9423. Internal furnaces burning solid fuel other than anthracite and equipped with mechanical underfeed stokers shall have a minimum height, which is the distance between the retort and the crown sheet or tubes of the boiler, of not less than shown in Table 9423T.

TABLE 9423T

Rated Horsepower	Under 18	18 to 50	51 to 80	81 to 100	101 to 125	126 to 150	151 to 200	201 to 250
Compact Boilers Height in inches..	36	42	48	54	60	66	72	78
Locomotive Firebox Height in Inches..	48	54	60	66	72	78	84	90

Power boilers with internal furnaces shall be operated at not more than 125 per cent of the rated capacity.

Furnaces designed for burning anthracite fuel will be given special ruling by the Buildings Engineer.

Internal furnaces with water legs raised on masonry to increase the height of the combustion chambers shall be protected on the inside by a refractory lining extending not less than 4 inches above the bottom of the water legs.

Furnaces for Cast Iron Boilers

Par. 9424. Furnaces for cast iron boilers burning solid fuel, other than anthracite, equipped with mechanical underfeed stokers shall have a minimum height between the retort and the crown sheet of the boiler of not less than shown in Table 9424T.

TABLE 9424T

Square feet of radiation (based on 240 Btu per square foot)	Under 2500	2500 to 6999	7000 to 10999	11000 to 13999
Height in inches....................	36	42	48	54

Furnaces designed for burning anthracite fuel will be given special ruling by the Buildings Engineer.

Fire Doors of Boiler Furnaces

Par. 9426. All fire doors or furnace doors on water tube boiler installations, unless such doors are of the inward opening type, shall be equipped with automatic safety latches to prevent such doors from being blown open in event of boiler tube failure or by pressure otherwise built up in the furnace.

Installation of Boiler Furnaces

Par. 9427. Furnaces for power boilers shall be so located that wood or other combustible material shall be not less than 3 feet from top or sides nor less than 5 feet from the front of such furnace and from the smokepipe thereof. All combustible material less than 5 feet from the top or sides or less than 10 feet from the front of such furnace shall be protected by at least 4 inches of concrete, brick or other incombustible material and shall be ventilated to prevent the temperature from rising above 160 degrees Fahrenheit.

Cast iron, steel, or concrete columns shall be not less than 4 inches from any part of a boiler furnace.

SECTION 943

DOMESTIC HEATING PLANTS

General Regulations of Domestic Heating Plants

Par. 9430. Every newly developed type of domestic heating plant shall be approved by the Buildings Engineer before any application is made for the installation of any such heating plant. For the purpose of Section 943, domestic heating plants shall include all plants furnishing not more than 1400 square feet of steam radiation or the equivalent thereof.

The regulations of Section 943 apply only to the furnace, boiler, casing and the connections thereto.

Domestic heating plants shall conform to all applicable requirements of this Chapter.

Classification of Domestic Heating Plants

Par. 9431. Domestic heating plants are divided into three classes:

1. Steam or vapor heating plants.
2. Hot water heating plants.
3. Warm air furnaces.

Location of Domestic Heating Plants

Par. 9432. Domestic heating plants shall be located in furnace rooms as required in Part IV.

Floors Under Domestic Heating Plants

Par. 9433. Furnaces of domestic heating plants shall not be set upon wooden floors, unless such furnaces rest upon pedestals consisting of at least 2 inches of solid brick and 4 inches of hollow tile, or the equivalent of these two materials, set on sheet metal plates at least as thick as No. 24 United States gauge. Such pedestals shall extend beyond the base of the furnace or casing at least 12 inches on the rear and sides and 36 inches in front if solid fuel is used, and at least 6 inches all around such base if liquid or gaseous fuel is used. Such tile shall be laid with open ends in contact. When solid fuel is used, an ash plate or ash pan of metal at least as thick as No. 24 United States gauge shall be provided above the base. Furnaces with water cooled bases may rest directly on sheet metal bases without any intervening masonry, provided the sheet metal is at least as thick as No. 14 United States gauge.

Other supports for domestic heating furnaces shall meet the requirements of Paragraph 9404.

Construction of Domestic Steam or Hot Water Heating Plants

Par. 9434. The construction of domestic steam and hot water heating boilers shall conform to the standard requirements of the American Society of Mechanical Engineers, 1935, and every boiler shall bear the A. S. M. E. stamp.

Construction of Domestic Warm Air Furnaces

Par. 9436. All domestic warm air furnaces with a total of 7 square feet or more of grate surface shall have a flue of sufficient height to give a minimum draft of 0.15 inches of water over the fire in the furnace under normal working conditions.

Metal casing tops of such furnaces shall be insulated with an air space or covered with magnesia, asbestos boiler covering, or sand. The tops of all openings for side casing collars shall be on one level. The casing collars shall be fitted into place with a proper flange, or bead, on the outside so as to form a dust-tight joint. All such collars shall be of the same size as the warm air pipes to which they are connected.

When but one duplex grating is used for both hot air and cold air as in a so-called pipeless furnace, the area of the cold air intake shall be not less than the area of the warm air outlet of the grating.

Where joists are cut to accommodate such furnaces, headers or other approved means shall be put in and braced so as not to weaken the structure of the floor above the furnace.

Installation of Domestic Heating Plants

Par. 9437. Domestic heating plants shall be so placed that the front is not less than 4 feet and the side and rear not less than 2 feet from any wooden or combustible construction, but the distance at the sides may be reduced to one foot if the combustible construction is covered with sheet metal or asbestos millboard for a distance of 3 feet beyond the furnace at the sides and top. The distance between the top of such heating plants to the bottom of a combustible ceiling or construction shall be at least 6 inches and if such distance is less than 12 inches the ceiling or construction shall be protected with one-quarter inch asbestos millboard or a metal shield kept at least 2 inches below the combustible ceiling or construction and extending at least 18 inches beyond the furnace on all sides. For heating plants using gas or oil fuel and provided with a positive fuel control to prevent overheating, these distances may be reduced to one foot on the sides and 3 feet in front, when the plant is so insulated as to produce a temperature of not over 160 degrees Fahrenheit at a distance of 6 inches when operating at maximum load.

Existing Domestic Heating Plants

Par. 9438. Every existing domestic heating plant which does not meet the requirements of this Code shall be made to conform therewith if it is or creates a fire hazard or a menace to life.

Maintenance and Operation of Domestic Heating Plants

Par. 9439. Every domestic heating plant shall be maintained in a safe working condition.

The maintenance and safe operation of all domestic heating plants shall be in accordance with the Fire Prevention Code of Baltimore City and the regulations of the Fire Department, which department shall enforce the same.

SECTION 944

SOLID FUEL BURNING SYSTEMS

Scope of Solid Fuel Burning Systems

Par. 9440. Solid fuel burning systems shall include every grate, stoker, and every other appliance or equipment designed, used or intended to be used for the burning of solid fuels to produce heat.

Approval of Solid Fuel Burning Systems

Par. 9441. No person, firm or corporation shall offer for sale, or install or use in the City of Baltimore, any automatic solid fuel burning system before a written approval of such automatic solid fuel burning system has been issued by the Buildings Engineer.

Approval of every stoker, pulverizer or other automatic solid fuel burning system shall be based on satisfactory report of tests for durability, positiveness of operation, and reliability of all electrical and mechanical controls whether manual or automatic, made by a nationally recognized laboratory acceptable to the Buildings Engineer.

Classification of Solid Fuel Burning Systems

Par. 9442. Solid fuel burning systems are divided into 3 classes:

Pulverized fuel systems.
Mechanical stokers.
Hand fired systems.

Pulverized fuel systems shall include all devices, apparatus or equipment, automatically or manually controlled, designed, installed and used to pulverize the fuel and to supply such pulverized fuel to a furnace in which it is being burned.

Mechanical stokers shall include all devices, apparatus, appliances or equipment, automatically or manually controlled, designed, installed, and used to supply solid fuel to a furnace in which fuel is being burned.

Hand fired systems shall include all systems in which solid fuel is supplied to the furnace by hand.

Pulverized Fuel Burning Systems

Par. 9443. The required combustion space for boilers having refractory settings, fired by pulverized coal, shall be determined on a maximum heat liberation basis of 15,000 Btu's per cubic foot per hour for boilers having a capacity of less than 500 horse power, and such combustion space for boilers of 500 horse power and over shall be designed by professional engineers and subject to the approval of the Buildings Engineer. The combustion space shall be considered as the clear space between the bottom of the boiler surfaces proper and any screen tubes over the ash pit. If no screen tubes are used, then the upper surface of the ash pit shall be considered as the bottom of the furnace volume.

Design and Construction of Mechanical Stokers

Par. 9444. Mechanical stokers shall be so designed that all gears, chains, ratchets, and other mechanisms necessary for their operation are properly protected to prevent accidental injury to the operators thereof during normal operation.

Grates for Solid Fuel

Par. 9445. Hand fired grates having a depth greater than 96 inches shall not be permitted.

Installation of Solid Fuel Burning Systems

Par. 9446. Every solid fuel burning system shall be installed in accordance with the applicable provisions of this Code and in accordance with the recommendations of the manufacture of such solid fuel burning system. If there is any conflict between the provisions of this Code and the recommendations of the said manufacturer, the provisions of this Code shall govern.

All such installations shall be approved by the Buildings Engineer before any solid fuel burning system is used.

Safety Requirements for Solid Fuel Burning Systems

Par. 9447. The air pressure in combustion chambers of systems for burning pulverized fuel shall be so controlled that the pressure in the supply pipes shall never be less than that of the secondary air.

Pulverized coal shall not be delivered to the storage bins at temperatures exceeding 200 degrees Fahrenheit.

All mechanical stoker or pulverized fuel installations applied to steam or hot water boilers, not under the constant control of a qualified operator, shall be equipped with automatically operated devices to shut down the firing equipment in the event of excessive pressure in a steam boiler and excessive water temperature in a water boiler.

Storage of Solid Fuels

Par. 9448. No part of any fuel bin constructed of wood or other combustible material shall be permitted less than 10 feet from the front of any fuel burning appliance or furnace, and no part of any fuel bin constructed of metal or other incombustible material shall be permitted less than 6 feet from the front of any fuel burning appliance or furnace.

The minimum distance of any part of a fuel bin which is on the side of or in the back of any fuel burning appliance or furnace may be reduced to one-half of that required when the bin is located in front of the fuel burning appliance or furnace.

For the permissible quantity of solid fuels stored in buildings see the Fire Prevention Code of Baltimore City.

Maintenance and Operation of Solid Fuel Burning Systems

Par. 9449. Every solid fuel burning system shall be maintained in safe working condition and properly operated in accordance with the instructions and directions of the manufacturer thereof and of the person, firm or corporation making the installation.

SECTION 945

OIL BURNING SYSTEMS

General Requirements for Oil Burning Systems

Par. 9450. The design, construction, installation, alteration, repair, maintenance and operation of every oil burning system, oil burner and all oil burning equipment designed, used or intended to be used for the burning of fuel oil, or other liquid fuel, shall conform, where applicable, to the regulations of the other Sections of this Chapter, as well as to the following regulations of this Section.

When oil is used as fuel, the combustion space for furnaces of boilers having a capacity equal to 2500 square feet of steam radiation or less shall be such that complete combustion of the fuel can take place in the furnace. The temperature of gases leaving the furnace shall not exceed 750 degrees Fahrenheit.

When oil is used as fuel in furnaces with a capacity of more than 2500 square feet of steam radiation but having a normal heat liberation of not more than 16 million Btu per hour, and having refractory walls, the required combustion space shall be determined on the basis of 20,000 Btu per hour per cubic foot of combustion space for normal operation. The maximum heat liberation shall not exceed the normal by more than 50 per cent. For larger furnaces and other types of walls complete details of the design shall be submitted to the Buildings Engineer for approval.

Approval and Registration of Oil Burning Systems

Par. 9451. No person, firm or corporation shall offer for sale for use in the City of Baltimore, or install or use in the City of Baltimore any oil burner or oil burning system before such oil burner or oil burning system has been registered in the Bureau of Buildings, and written approval has been issued by the Buildings Engineer.

General approval of every oil burner and oil burning system shall be based on the satisfactory report of tests for durability, positiveness of ignition, safeguards against flooding and reliability of all electrical and mechanical controls whether manual or automatic, made by a nationally recognized laboratory acceptable to the Buildings Engineer.

If at any time after a general approval certificate has been issued for any oil burner or oil burning system, a change is made in the design of said oil burner or oil burning system, or it is desired to change any of the conditions of any such certificate, application shall be made for a new general approval certificate, and the Buildings Engineer shall have the right, if he deems it necessary, to require new inspections and tests to be made of such oil burner or oil burning system before issuing the required certificate.

Classification of Oil Burning Systems

Par. 9452. Oil burning systems are divided into three classes, as follows:

Class A Oil Burning Systems—Systems burning oil which are completely automatic in operation; that is, which are self-starting and self-stopping.

Class B Oil Burning Systems—Systems burning oil which are semi-automatic in operation; that is, which are self-stopping, but not self-starting. Systems which are equipped with steam atomizers are also included in this class.

Class C Oil Burning Systems—Systems burning oil which are non-automatic in operation, that is, which are neither self-starting nor self-stopping.

Equipment for Oil Burning Systems

Par. 9454. Pipes for fuel oil burning systems shall be at least standard wrought iron, steel, brass or copper pipe, or approved brass or copper tubing with approved fittings. The pipe for domestic heating plants shall not be smaller than one-quarter inch iron pipe size and pipe for industrial systems shall be not smaller than one-half inch iron pipe size or copper or brass tubing having the same internal area. Brass or copper tubing shall have a wall thickness of not less than .049 inch.

No soldered fittings shall be permitted. Sweated fittings shall be permitted only when 50 feet or more away from the furnace.

When the oil is pumped to the burner, the return pipe shall be not less in diameter than that of the supply line.

Flexible metallic tubing employed for the purpose of reducing the effects of jarring and vibration, or for providing swing joints, shall be of an approved type and shall be permitted only as a part of the burner assembly.

Safety Controls for Oil Burning Systems

Par. 9455. All Class A and B oil burning systems shall be equipped with an automatically operated device arranged to shut off the oil supply in the event of the failure of ignition or flame.

Class A and B oil burning systems used in connection with steam, hot water or warm air heating systems, shall be equipped with automatic devices to shut down the burner in the event of steam pressure in excess of the working pressure, water temperature in excess of the operating temperature, or air temperature over that permitted in Chapter 95, within a steam boiler, hot water boiler, or warm air furnace or plenum chamber respectively.

Class C oil burning installations shall have a qualified operator in constant attendance.

Limiting controls intended to disconnect the burner from the electric power supply shall be connected into the burner supply circuit on the supply side of all other burner-circuits.

Every electrically driven Class A and B oil burning system shall have a switch located at a convenient point outside of the furnace room, so arranged that the burner may be stopped manually in case of emergency.

Oil burning systems not electrically driven shall be provided with a quick closing valve in the oil supply line arranged so as to be operated outside the furnace room.

Oil burning systems using either steam, compressed air, or mechanical devices to atomize the oil shall have the oil supply and atomizing supply interlocked in such a manner so as to immediately shut off the oil supply in the event of an interruption of the atomizing.

All automatic pumps not an integral part of the burner shall be arranged to stop automatically to prevent the continuous discharge of oil in case of pipe breakage.

Where fire protection equipment is dependent upon a boiler plant fired by oil burning equipment, the pumps supplying the oil to the burners shall be installed in duplicate.

Where conditions are such that syphoning is possible from oil storage tanks exceeding 300 gallons in capacity anti-syphoning devices shall be installed in all pipe lines where syphoning can occur, except where No. 6 or heavier oil is used.

Storage and Auxiliary Pressure Tanks for Oil Burning Systems

Par. 9456. The design, construction and installation of storage tanks for oil burning systems shall conform in every respect to the regulations governing storage tanks of Class III liquids in Chapter 97.

Unprotected tanks shall not be located within 7 feet, measured horizontally, from any fire or source of flame. Where the structural conditions of the building are such as to prevent placing the tank 7 feet or more away from any fire or source of flame, the tank may be located closer provided it is protected by a metal shield. This shield shall meet the requirements of Paragraph 9484, and shall be so located that the distance between the source of flame and the tank, measured in the clear around the shield, in any direction, shall be not less than 10 feet. An air space of not less than 6 inches shall be provided between the shield and the tank. In no case shall the horizontal distance between the source of flame and the tank be less than 5 feet.

Auxiliary pressure tanks shall be provided with a reliable pressure gauge and an automatic relief valve piped to discharge to the storage tank.

Installation of Oil Burning Systems

Par. 9457. Previous to the installation of an oil burner in an existing furnace, the furnace shall be thoroughly cleaned out, the ash door of the furnace shall be permanently removed, or bottom ventilation otherwise provided to prevent the accumulation of vapors within the ash pit, unless the burner is of a type which mechanically purges the ash pit.

Where oil burners are installed in sectional hot air furnaces which have been in use one heating season or more, the furnace shall be dismantled, all joints cleaned, and the furnace reset with an approved fire-resistant cement. Refractory material not less than one inch in thickness shall be installed for gun type nozzle so as to prevent direct impingement of flame on metal of furnace.

No oil burner shall be installed in a furnace not having a combustion chamber large enough to completely burn the fuel.

Every burner shall be properly supported independently of its piping.

All burner units shall be fitted with conically faced union joints of approved type to facilitate removal, as no right and left hand couplings or similar connections will be permitted.

When more than one burner is installed in a single combustion chamber, each burner shall be equipped with an independent set of controls which will prevent the possibility of uncertain operation, and designed so as to prevent the abnormal discharge of oil.

Installation of Piping for Oil Burning Systems

Par. 9458. All pipe connections shall be made tight in a substantial and workmanlike manner.

Piping shall be run as directly as possible, and in the case of a pumping system so laid that if practicable the pipes are pitched back towards the storage tanks without traps.

Every oil burning system shall have an accessible hand valve placed as near the supply tank as possible.

Where an automatic cut-off valve is not a part of the burner, a readily accessible hand valve shall be installed in the oil supply line at the burner.

Pipes leading to the surface of the ground or above the floor, particularly risers to furnaces, shall be protected against injury and rigidly supported to prevent vibration. Fill pipes and vent pipes shall also be protected by approved metal guards.

Openings for oil pipes through outside walls below ground level shall be made oil tight and securely packed with flexible material.

All outside piping shall be laid in solid earth, or in a masonry lined trench. Oil pipes shall not be located near nor in the same trench with other piping except steam lines for heating the oil. Propping pipes on wood blocks shall not be permitted.

After the installation of every oil burning system has been completed, an examination of all piping and fittings shall be made to determine that there are no leaks at normal working pressures.

All piping for every class of oil burning system shall be carefully protected against mechanical injury and proper allowance shall be made for expansion, contraction, jarring and vibration in a manner satisfactory to the Buildings Engineer.

No oil or vent pipe shall be permitted to be installed in any enclosed elevator or stair shaft.

Maintenance and Operation of Oil Burning Systems

Par. 9459. Every oil burning system shall be maintained in safe working condition and properly operated in accordance with the instructions and directions of the manufacturer thereof and of the person, firm or corporation making the installation.

Any oil burning system which is dangerous to life or property shall be dismantled or otherwise put out of service.

A diagram of all oil mains, control valves and emergency switches shall be posted in the furnace room of every oil burning system supplying heat for any high or low pressure boiler exceeding 100 horsepower commercial rating, or where oil preheaters are used.

Every oil burning system shall be operated in accordance with the Fire Prevention Code of Baltimore City and the regulations of the Fire Department, which department shall enforce the same.

SECTION 946

GAS BURNING SYSTEMS

General Requirements for Gas Burning Systems

Par. 9460. The design, construction, installation, alteration, repair, maintenance and operation of every gas burning system, gas burners and gas burning equipment and gas piping designed, used or intended to be used for the burning of any gaseous fuel, except acetylene, shall conform to the regulations contained in Section 946.

Classification of Gas Burning Systems

Par. 9461. Gas burning systems are divided into three classes as follows:

1. Automatic gas burning system. This class of system includes every gas burning system which is completely automatic in its operation.

2. Semi-automatic gas burning systems. This class of system includes every gas burning system which is equipped with an automatic control to shut off the gas.

3. Non-automatic gas burning appliances. This class of system includes every gas burning appliance which is operated by hand.

Approval and Registration of Gas Burning Appliances

Par. 9462. Domestic gas burning appliances, tubing, appurtenances and devices shall have been approved and registered by the Commissioner of Health, as provided in Ordinance No. 436 of the Mayor and City Council of Baltimore approved July 7, 1925, and all amendments thereto, and all rules, regulations and specifications adopted or promulgated in accordance with said Ordinance No. 436, before being used, installed or erected, and shall be adapted to the system in which such appliances, tubing, appurtenances and devices are to be used.

All other gas burning appliances, tubing, appurtenances and devices not required to be approved and registered by the Commissioner of Health shall be approved as to structural design, construction, installation and safety of operation by the Buildings Engineer and registered in the Bureau of Buildings before being used, installed or erected in the City of Baltimore. Such approval shall be based on the satisfactory report of tests for durability, positiveness of ignition, safeguards against gas escapement and reliability of all electrical and mechanical controls whether manual or automatic, made by a nationally recognized laboratory acceptable to the Buildings Engineer, or made by the Bureau of Standards of Baltimore City. If at any time after an approval certificate has been issued by the Buildings Engineer for any such gas burning appliance, tubing, appurtenance or device, a change is made in the design of said appliance, tubing, appurtenance or device, or it is desired to change any of the conditions of any such certificate, application shall be made for a new approval certificate, and the Buildings Engineer shall have the right, if he deems it necessary, to require new inspections and tests to be made of such appliance, tubing, appurtenance or device before issuing the required certificate.

Nothing in Par. 9462 shall be taken or be construed to apply to tubing, appliances, appurtenances or devices used strictly for experimental purposes, or to require registration or the issuance of a certificate for any non-standard gas burning appliances used strictly for industrial purposes.

Installation of Gas Meters

Par. 9463. Gas meters shall not be placed under steps, under shop windows, in an unventilated closet or other small confined space, in a coal bin, driveway, passageway, or other location where such meters may be subject to damage, except when no other space is available and in no case shall any such meter be placed near a furnace or boiler or any equipment which produces large heating effects. Gas meters shall be located at a safe distance from any probable source of unguarded flame or electric sparks and where they will not be subject to unusual corrosion. Gas meters shall be placed either in the cellar, basement or the first story when no cellar or basement exists, or in any story if no other space is available.

Gas meters shall be independently supported and shall be connected to the piping so as not to exert undue strain on the connections.

Gas Piping

Par. 9464. All pipes and fittings for gas fuel shall be clear and free from cutter burrs and defects in structure or threading. Such pipe shall be of at least standard weight, of wrought iron or steel, and manufactured according to the "Standard Specifications for Welded Wrought Iron Pipe", Serial Designation A72-38, or the "Standard Specifications for Black and Hot-Dipped Zinc Coated (Galvanized) Welded and Seamless Steel Pipe", Serial Designation A120-36, of the American Society for Testing Materials. Such fittings shall be of at least standard weight, beaded type, tapped and free from defects, of malleable iron hot galvanized inside and outside, except that for sizes of 4 inches and larger,,cast iron or cast steel may be used.

Such piping shall be of a size and so installed as to provide a supply of gas sufficient to meet the maximum demand without undue loss of pressure between the point of supply, the meter, and the appliance or appliances. The following factors shall be considered when determining the pipe size: Length of pipe, number of fittings, each ell fitting in the line being equivalent to 10 linear feet of pipe, maximum consumption to be provided for, and allowable loss in pressure from meter to appliances. The following table shall be used to determine the pipe size for a pressure drop of 0.3 inch of water and specific gravity 0.60:

TABLE 9464T

Cubic Feet of Gas Delivered Per Hour

Length of pipe. feet	Diameter of Pipe in Inches									
	½	¾	1	1¼	1½	2	3	4	6	8
15	76	218	440	750	1220	2480	6500	13880	38700	79000
30	55	155	320	535	850	1780	4700	9700	27370	55850
45	44	124	260	435	700	1475	3900	7900	23350	45600
60	38	119	226	380	610	1290	3450	6800	19330	39500
75	..	97	200	345	545	1120	3000	6000	17310	35300
90	..	88	180	310	490	1000	2700	5500	15800	32250
105	..	80	168	285	450	920	2450	5100	14620	29850
120	..	..	158	270	420	860	2300	4800	13680	27920
150	..	..	140	242	380	780	2090	4350	12240	25000
180	..	..	128	225	350	720	1950	4000	11160	22800
210	..	..	..	205	320	660	1780	3700	10330	21100
240	..	..	..	190	300	620	1680	3490	9600	19740
270	..	..	..	178	285	580	1580	3250	9000	18610
300	..	..	..	170	270	545	1490	3000	8500	17660
450	..	..	..	140	226	450	1230	2500	7000	14420
600	..	..	..	119	192	390	1030	2130	6000	12480

House piping shall be run to a point within 2 feet, measured horizontally, of the service pipe. In apartment houses or buildings where a number of meters are to be placed in one location, all house piping shall be brought to this location.

Piping shall be free from sags where liquid condensate may collect. Horizontal pipes shall drain to the riser, and from the riser to the meter. Pipes shall be supported or fastened with pipe hooks, bands, or hangers firmly fastened to rigid supports and spaced so as to provide adequate supports without sags.

Outlets shall extend one inch through finished walls or partitions and either the outlet fitting or the pipe shall be securely fastened to the wall or partition. In the case of masonry walls, a hole in the wall shall be plugged either with a wooden plug, or a metal expansion plug, and the pipe bands or hooks securely fastened to the plug. All branch outlet pipes shall be taken from the top or sides of running lines. A tee fitting with the bottom outlet plugged or capped, shall be used at the bottom of all risers and drops.

The pipes shall not be run under beams or floor joists where they will be covered with plastering, but shall be run near the top of the beams or joists. Where it is necessary to notch wooden beams or joists, the requirements in Paragraph 6233 shall be complied with. Refer to Paragraph 6663 for pipe passing through concrete. In no case, however, shall the building structure be weakened by the installation of the piping.

Gas piping shall not be run on the outside of any building walls or in any vestibule. Where there are overhanging kitchens or other rooms built beyond foundation walls in which gas appliances are installed, the piping shall be brought up inside the building proper and run around the sides of the rooms.

Where pipe is to be run from one building to another, it shall be placed underground, except as permitted herein. The pipe so installed shall be of galvanized iron or galvanized steel and of the next size larger than is required in the buildings, with a minimum size of one inch. It shall be installed below the frost line and have a continuous grade to one end where liquid condensate may be collected in a drip from which it may readily be removed. Should a change of grade be necessary, a drip pot with standpipe and roadway cover shall be placed at all low points. In those cases where the distance between buildings is very short, overhead lines are permissible, if adequate protection from excessive changes in temperature is provided to prevent the formation of frost or condensate in the line.

No bending of gas pipe is permissible, the necessary change of direction being made by the use of fittings. All-thread nipples shall not be used. On enclosed work, either long screws or unions of the galvanized, ground-joint type and center punched shall be used. Every gas cock or valve used shall be so placed as to be readily accessible for maintenance and repair. Fitter's cement or wax shall not be used under any condition. White lead or other pipe joint compound or "dope" is to be used sparingly and applied to male pipe threads only. In no case is it permissible to make permanent repairs to defects in pipe or fittings, but such defects having been located, the defective pipe or fittings shall be removed and replaced with perfect material.

Before any system of gas piping is finally put in service, it shall be carefully tested to insure that it is gas tight. Where any part of the system is to be enclosed or concealed, the test shall precede the work of closing in. The piping shall be so constructed as to withstand a pressure of air equal to at least 3 times the service pressure, for a period of 15 minutes without showing any drop in pressure, after sufficient time has been allowed for the pressure in the pipe to reach a state of equilibrium. In domestic installations, the service pressure shall be assumed to be at least one pound per square inch.

When additional piping or appliances are installed to existing systems of gas service which necessitate turning off the gas at the meter, the following tests shall be made:

Turn-Off Test: Before turning off gas at the meter, all burners and burner cocks on the premises supplied by gas through the meter shall be turned off and the meter test hand observed for a sufficient length of time to ascertain that there is no gas passing through the meter. In case of a meter supplying an Industrial building, Institution, and more than one consumer in a Dwelling, after having turned off all appliance cocks and having observed the meter test hand to ascertain that there is no gas passing, a burner of 5 cubic feet or less per hour capacity shall be lighted before shutting off the meter, except for an emergency shut-off, to ascertain that the meter will register a small amount of gas. The meter shall again be tested to prove that it will register the gas to such a burner in the course of the "turn-on" test. If possible, the failure of the meter to so register a small quantity of gas shall be ascertained in advance of the "turn-off" test, so that arrangements may be made to have another meter available on the job before it is time to restore service.

Where there is more than one meter on the premises, pipe lines shall be traced to insure that the proper meter is located.

Turn-On Test: Before turning gas under pressure into any piping, the person in charge shall assure himself that there are no openings from which gas can escape. The meter shall next be turned on and the hand on the test dial, a small dial generally above the regular dials, carefully watched to ascertain that no gas is passing through the meter. If the test hand shows any movement and all cocks, pilot burners, and so forth, supplied through the meter, are found tight, it will be indicated that there is a leak in the house piping. The meter cock shall then be turned off until the necessary repairs have been made, after which the above tests shall be repeated.

No flame or fire in any form shall be used in attempting to locate a gas leak or when there is an odor of gas present. If the leak cannot be found by the sense of smell, soap suds shall be applied to the suspected location until the leak has been found.

If careful observation of the test hand for sufficient length of time reveals no movement, the piping shall be purged and a burner of 5 cubic feet or less per hour capacity lighted and the hand of the test dial again observed. If the test hand does not show a movement, the person, firm or corporation who owns the said meter shall then be notified to change the meter and the test shall be repeated. Before leaving the premises, all air shall be drawn from piping and appliances and all pilot burners of incandescent lamps, automatic appliances, or gas range lighters, shall be lighted and properly adjusted. When purging pipes supplying appliances which have burners enclosed in spaces wherein gas may collect, such as the oven of a range, the air shall be purged in so far as possible, from an opening outside of the enclosure. The person in charge shall assure himself that the piping and appliances are fully purged before leaving the premises.

Safety Controls for Gas Burning Systems

Par. 9465. Every automatic gas burning system shall be equipped with an automatically operated device arranged to shut off the gas supply in the event of the failure of ignition or pilot flame. Such gas burning systems used in connection with steam, hot water or warm air heating systems shall be equipped with automatic devices to control the burner in the event of steam pressure in excess of the working pressure, water temperature in excess of the operating temperature in boilers, and air temperature in excess of that permitted in Chapter 95 in the furnace or plenum chamber. Every automatic, semi-automatic and non-automatic space heater in sleeping rooms for the use of transients shall be equipped with an effective device to ignite the main burner or which will automatically shut off the main gas supply in case the means of ignition becomes inoperative.

Installation of Gas Burning Appliances

Par. 9466. Previous to the installation of a gas burner in a furnace in which fuel other than gas has been burned, such furnace shall be thoroughly cleaned out, the fire door thereof shall be arranged so that it cannot be positively latched and it shall be provided with a spring allowing it to open in case of excess pressure in the combustion chamber and after relief of pressure to return to a closed position.

Sectional warm air furnaces shall be tested to ascertain that all joints between the combustion chamber and the plenum chamber are tight.

No gas burner shall be installed in a furnace having a combustion chamber smaller than required for complete combustion.

Appliances shall be adequately supported and so connected to the piping as not to exert undue strain on the connection.

Appliances shall not be installed so that their continued operation will in any way create a health or life hazard to persons or a fire hazard to property, nor shall they be installed in a room in which the facilities for ventilation do not permit the proper combustion of the gas under normal conditions of use.

Appliances equipped with a control cock or cocks shall not be connected with flexible rubber-ended gas tubing.

Flexible gas tubing shall be of adequate capacity, gas tight, and so designed as to permit a secure attachment to the nozzles of appliances and cocks. A stop cock shall always be provided at the end where the tubing is attached to the house piping.

Gas cocks controlling several appliances or lighting fixtures shall be placed at an adequate distance from each other so that they will be readily distinguishable and when constituting the only means of gas control, shall be easily accessible and within convenient reaching distance when lighting the burner.

No water heating appliance shall be installed in a closed system of water piping unless a relief valve is provided in accordance with the plumbing regulations of the Commissioner of Health. By a closed system is meant a system of water piping without an expansion tank open to the atmosphere.

When air or oxygen under pressure is used in connection with the gas supply effective means shall be provided to prevent the air or oxygen from going back into the gas piping.

No device or attachment shall be installed on any appliance which may in any way impair the combustion of gas. Similarly, any combination of appliances, attachments, or devices used together in any manner shall meet the requirements which apply to individual appliances.

Gas shall not be left turned on until the appliance and its connections as installed have been tested and found gas tight. The appliance shall then be properly adjusted, and the consumer instructed as to its safe operation.

Flues and Vents for Gas Burning Systems

Par. 9467. Every gas appliance except as noted below shall be connected to an effective flue or other adequate ventilating facilities if it is included in any of the following classifications:

a. Appliances having an aggregate demand at normal rating in excess of 30 Btu per hour per cubic foot of room content.

b. Automatically controlled appliances which use more than 5,000 Btu per hour, that is, 10 cubic feet of gas per hour. Automatically controlled appliances which use less than this amount shall be flue connected unless equipped with an effective device which, in the event that the means of ignition becomes inoperative, will automatically shut off the gas supply to the main burner or burners. For the purpose of this rule "automatically controlled appliances" shall not include appliances equipped with devices or controls governing the supply of gas to the main burner or burners which cannot automatically reduce the supply below 30% of the "maximum" demand.

Manually and semi-automatic controlled domestic gas ranges and automatically controlled ranges equipped with safety pilots are exempt from the provisions under "a" and "b". Automatic instantaneous gas water heaters each supplying only a single fixed faucet, if equipped with a safety pilot and if installed immediately adjacent to the faucet, are exempt from the provisions under "b".

The area of the flue shall be not less than the area of the largest vent connection inlet plus 50 per cent of the areas of all other additional inlets, but no flue shall have an area of less than 6 square inches nor shall any inside dimension of the flue be less than 2 inches.

Every flue-connected gas burning appliance, except an incinerator or industrial equipment requiring solid flue connections for normal operation, shall be equipped with an approved draft hood, unless the construction of such appliance serves the same purpose.

Before making a flue connection, the chimney or flue shall be examined to ascertain that it is properly constructed, clear and will normally conduct the products of combustion to the outer air.

The vent pipe or connections to the flue of appliances designed for gas shall not be smaller than the size of the vent collar of the appliance. When the appliance has more than one vent, the area of the vent pipe shall equal the combined area of the vents for which it acts as a common connection to the flue.

The horizontal vent connection shall be as short as possible. For long runs, the size of the vent pipe shall be increased after every 10 feet in length, and it shall maintain a pitch or rise from the appliance to the flue or chimney. This pitch or rise shall be at least one-quarter inch to the foot of the horizontal length.

The vent pipe shall be so installed as to avoid sharp turns or other constructional features which would create excessive resistance to the flow of the gaseous products.

In entering the flue or chimney, the connection shall be above the extreme bottom. When two or more vent pipes are connected to a chimney flue, the connections shall be at different levels. Means shall be employed which will prevent the reduction of the necessary flue area by the vent pipe entering the flue.

The material used for the vent pipe shall be such or so protected as to resist the corrosive action of flue gases and condensate. The chimney flues shall be of corrosion-resisting material, and the joints between different sections shall be made tight. Butt joints of flues shall be sealed with cement, and male, spigot, or crimped ends of joints shall be installed pointing down.

All parts of metal vents on the furnace side of cold air inlets of draft hoods shall be at least 6 inches and beyond the cold air inlet all parts of metal **vents shall be at least 3 inches, from** combustible construction without fire-resistive protection.

The draft hood shall be placed in a vertical position adjacent to the appliance. If this is not practicable, a draft hood of approved design may be installed in a horizontal position.

Where automatic gas appliances are vented into flues to which furnaces burning oil or pulverized coal, or incinerators are connected, the gas appliances shall be equipped with approved devices which, in the event that the pilot or constantly burning flame is extinguished, will automatically shut off the gas to the main burner or burners.

Refer to Section 784 for the construction of chimneys and flues.

Storage of Gaseous Fuels

Par. 9468. Portable containers for gas fuels shall be of a type acceptable for distribution in interstate commerce and marked to the effect that they comply with the Interstate Commerce Commission specifications and regulations.

Where this type of container is used in Public Assembly buildings, Private Assembly buildings, Dwellings with more than 3 apartments or Institutions, the containers and regulating equipment shall be placed in an incombustible enclosure, located outside of and not less than 10 feet from any opening in the exterior walls of any of the aforementioned buildings. The discharge from safety reliefs shall be located not less than 10 feet away from any opening in any building.

Gas of public utilities shall be stored in accordance with Paragraph 9728.

For regulations of acetylene storage, refer to Paragraph 9479.

Maintenance and Operation of Gas Burning Systems

Par. 9469. Every gas burning system shall be maintained in a safe working condition and properly operated in accordance with the instructions and directions of the manufacturer and of the person, firm or corporation furnishing and installing the gas burning system.

Complete instructions relative to the care and operation of every domestic automatic or domestic semi-automatic gas burning system shall be permanently attached to or posted near the furnace or appliance and said instructions shall be maintained in a legible condition.

Every gas burning system found dangerous to health, life or property shall be put out of service.

SECTION 947

MISCELLANEOUS FUEL BURNING APPLIANCES AND SYSTEMS

General Regulations for Miscellaneous Fuel Burning Appliances

Par. 9470. This Section includes regulations for incinerators, ranges, stoves, fireplaces, space heaters, ovens, roasters, kilns, forges, and for acetylene generating and burning systems.

Complete drawings and specifications for incinerators, shall be submitted with the application for permit, except for such incinerators which have been approved and certified.

Class A Incinerators

Par. 9471. Class A incinerators shall include all stationary and portable low-temperature, non-fuel-fired incinerators used for the destruction of garbage together with other combustible refuse.

In the stationary type of Class A incinerators the smoke flue thereof may serve also as a charging chute, while the portable type of said incinerators shall be provided with a separate charging opening at the top thereof.

Not more than one service opening shall be permitted in the flue of Class A stationary incinerators installed in Public Assembly buildings, Institutions, Office buildings, Storage and Industrial buildings or restaurants. In Commercial buildings except restaurants, the use of such Class A incinerators shall not be permitted. In Private Assembly buildings and Dwellings, Class A incinerators shall be permitted without restrictions.

All such Class A incinerators shall be equipped with a device for primary ignition, such as a gas or oil burner.

Combustion chambers for the stationary type of Class A incinerators, in which the horizontal projection of the grate and hearth area is 9 square feet or less, shall be enclosed by walls of solid masonry not less than 3¾ inches thick, lined with not less than 4½ inches of fire brick. The enclosing walls of such combustion chambers in which such area exceeds 9 square feet shall be of solid masonry not less than 8 inches thick or of reinforced concrete not less than 6 inches thick, all lined with not less than 4½ inches of fire brick and provided with a one-half inch or larger air space between the wall and lining. The fire brick shall conform to the "Standard Specifications for Refractories for Construction of Incinerators" of the American Society for Testing Materials, Serial Designation C106-39, and shall be laid in fire clay mortar.

The incinerator flues for the stationary type of Class A incinerators shall be constructed plumb and straight and the inside clear area and least dimension thereof shall be not less than the following:

a. For incinerators with one service opening only, 126 square inches and 11¼ inches;

b. For incinerators with six or less service openings, 248 square inches and 15¾ inches;

c. For incinerators with more than six service openings, 314 square inches for circular flues, and 297 square inches for rectangular flues and 17¼ inches.

Such flues shall terminate in a metal screen protected against corrosion and having ¼ inch or smaller openings or shall be provided with an expansion chamber. Where the expansion chamber is located above the roof of the building in which it is installed it shall be constructed of brick or metal protected against corrosion, supported on metal legs at least 6 inches high, and the bottom shall be lined with fire brick at least two-and-one-half inches thick. Where the expansion chamber is below or partly below such roof, it shall be of a construction having at least the same fire-resistiveness as that of the charging chute, and shall have incombustible supports. All expansion chambers shall have a vent to the outside with an area equal to that of the flue. All flues and chimneys shall be constructed as required in Section 784.

The clear area of any service opening into the flue of a stationary Class A incinerator shall not exceed one-third of the clear flue area, except that where only one such opening is provided, its area may be not more than one-half of the flue area. All service openings shall be equipped with an approved hopper or other charging device so designed that the opening will be closed during the loading operation. For this purpose they shall be so counter-weighted, balanced or otherwise arranged as to secure positive closure of the opening. No part of such hopper or device shall project into the flue area.

Portable Class A incinerators shall be of a type approved by the Buildings Engineer and the Board of Fire Commissioners.

The charging opening of portable Class A incinerators with more than 5-bushel capacity shall be provided with a self-closing door. Refuse chutes of such incinerators shall not be connected directly to the combustion chamber thereof.

Portable Class A incinerators shall be supported on incombustible floors, on masonry bases resting on the ground or on hearths, constructed as required for fireplaces in Paragraph 9476, extending at least 12 inches beyond the outlines of the incinerator. Such incinerators shall be so placed that the clear distance from any combustible construction will be not less than 4 feet at the top and front, and 3 feet at the side and rear, except that when the incinerator is encased by a low conducting incombustible material at least one-and-one-half inches thick, such distances may be 3 feet at the top and 2 feet at the side and rear.

The smoke pipe of portable Class A incinerators shall be constructed and insulated as required in Paragraph 9482.

Class B Incinerators

Par. 9472. Class B incinerators shall include all medium-temperature fuel fired incinerators used for the destruction of garbage or of industrial waste materials.

Such Class B incinerators shall be permitted in any building, irrespective of occupancy, without restrictions.

Class B incinerators shall be placed in rooms serving no other purpose except that heating plants and bins containing waste may be located therein. Such rooms shall be enclosed by four-hour fire-resistive construction with all openings therein, other than intakes to the outside air, protected by Class B fire doors, except that in dwellings containing not more than two apartments, such enclosures may be omitted, if the floor above the incinerator is of one-hour fire-resistive construction, with at least 3 feet of clearance above the top of the incinerator.

The enclosing walls and the roof of the combustion chamber of Class B incinerators shall be of solid masonry not less than 8 inches thick or of reinforced concrete not less than 6 inches thick, or of at least 4 inches of masonry encased in a steel plate not less than three-sixteenths of an inch thick. All such walls and the roof shall be lined with not less than 4½ inches of fire brick in incinerators designed to burn less than 250 pounds of garbage or waste per hour, and with not less than 9 inches of fire brick in incinerators of a greater capacity. All brick walls of combustion chambers of Class B incinerators shall be well stayed with structural steel shapes. Metal framework supporting the roof of such incinerators shall not be exposed to the heat of the combustion chamber thereof. The fire brick for the lining of such incinerators shall be as required for Class A incinerators.

Chutes used to convey waste or rubbish to Class B incinerators shall be constructed and arranged as required for Class C incinerators. Charging chutes of Class B incinerators for garbage or garbage and rubbish shall be of not less than No. 12 United States standard guage steel lined with at least 4½ inches of fire brick or 8 inches of other brick. Such chutes shall not extend more than 12 feet above the combustion chamber.

The smoke pipes to flues of Class B incinerators shall be of the following materials:

TABLE 9472T

Diameter or Greatest Dimension in Inches	U. S. Standard Gauge of Metal Pipe	Fire Brick Lining, in Inches
12 or less	16 or over	....
18 or less	12 or over	2½
More than 18	12 or over	4½

A clearance of at least 36 inches shall be maintained between the smoke pipes and any combustible construction, except that where the pipes are guarded by a metal shield with at least 3/16 inch asbestos, the clearance may be not less than 18 inches.

All chimneys and flues shall be constructed as required in Section 784.

Class C Incinerators

Par. 9473. Class C incinerators shall include all incinerators used for the destruction of large quantities of rubbish or waste or both.

Class C incinerators shall be permitted in any building, irrespective of occupancy, without restrictions.

The combustion chamber of a Class C incinerator shall be located in a room serving no other purpose, except that a heating plant may be located in such a room. The conveying chute terminal and containers for delivering rubbish or waste to be burned in a Class C incinerator shall be located in a room used for no other purpose, and such room shall adjoin the room where the combustion chamber of such Class C incinerator is located. Where the combustion chamber of a Class C incinerator is charged directly from a floor above, the charge opening shall be located in a room containing no other equipment or materials. All such rooms shall be enclosed in four-hour fire-resistive construction with all openings therein, other than intakes to the outside air, protected by Class A fire doors, and where such openings lead to rooms other than required herein, they shall be protected with a Class A fire door on each side.

The enclosing walls and the roof of the combustion chamber of a Class C incinerator shall be of solid masonry at least 8 inches thick, or of reinforced concrete not less than 6 inches thick. All such walls and roof shall be lined with at least 4½ inches of fire brick in Class C incinerators having a grate area of 9 square feet or less and with not less than 9 inches of fire brick in Class C incinerators with a larger grate area. Metal framework supporting the roof of a Class C incinerator shall not be exposed to the heat of the combustion chamber thereof. The fire brick for the lining of Class C incinerators shall be as required for Class A incinerators.

Where the combustion chamber of a Class C incinerator is charged directly from above, the length of the direct charging chute shall not exceed 6 feet. Mechanical stokers or conveyors for the transfer of rubbish or waste from the chute terminal of a Class C incinerator to the combustion chamber thereof shall be of a type approved by the Buildings Engineer.

The separate chutes for conveying rubbish or waste to Class C incinerators shall be constructed of solid masonry not less than 8 inches thick or of reinforced concrete not less than 6 inches thick. They shall be supported by incombustible construction. Such chutes shall extend through the roof of the building in which they are located and shall be covered by a vent hood or skylight with thin plain glass. The feed openings in such chutes shall be protected by Class C fire doors or other approved doors. Each such opening shall be located in a room serving no other purpose and enclosed by one-hour fire-resistive incombustible construction, with all openings therein protected by Class C fire doors. Such conveying chutes shall terminate in a room as described hereinbefore.

Metal smoke pipes to flues for Class C incinerators shall be as required for Class B incinerators, except that all such pipes shall be lined with fire brick, which shall be at least 2½ inches thick in pipes 18 inches or less in the greatest dimension, and at least 4½ inches in larger pipes.

All chimneys and flues shall be constructed as required in Section 784.

Ranges and Water Heaters

Par. 9474. Domestic ranges, domestic hot water heaters and hot plates shall be so constructed that the maximum temperature at points 6 inches from the back and sides of the body of any such appliance, and on the floor under the appliance the maximum temperature shall be not more than 90 degrees Fahrenheit in excess of the room temperature after one hour's operation.

The location of a domestic range shall be such as not to constitute a fire hazard to persons or property. Except for ranges designed for flush installation, a distance of at least 6 inches shall be maintained between the body of the range and any combustible construction or material. Where flues extend out from the back of the range more than 4 inches, a clearance of at least 2 inches shall be maintained between the flue and any combustible construction or material.

Where a range of the commercial type is installed on a combustible floor or near combustible walls, without fire-resistive protection, it shall be so constructed that the maximum temperature at points 6 inches from the back and sides of the range and on the floor under the range is not more than 90 degrees Fahrenheit in excess of room temperature, or, if the range does not meet these requirements, it shall be installed as follows:

A commercial range without legs installed on a combustible floor shall be insulated by placing the range upon a base consisting of 3-inch high open end hollow building tile, covering the entire bottom of the range. The tile shall be kept in place by a holding strip at least one inch high fastened to the floor on all four sides. The tile shall be placed end to end so that the ducts are continuous throughout the required length and shall be parallel to the front of the range. The ends of the tile shall be not less than 3 inches from any wall.

A commercial range equipped with legs of standard height, approximately 3 inches, installed on a combustible floor, shall be insulated by placing the range upon a base consisting of a 24 gauge sheet steel mat covering the entire bottom of the range, upon which is superimposed two standard 3-inch channels inverted, running parallel to the range front and so placed that the range legs will rest on the back of the channels. The channels shall be covered with a No. 24 gauge sheet steel shield running the required length to form an air chamber. The shield shall be turned over the channels, made flush with the mat, both front and back, and securely fastened to the floor. The ends of the air chamber shall be left open and shall be not less than 3 inches from any wall.

A commercial gas range installed near a combustible wall shall be placed at least 12 inches from such wall, except where a shield is placed between the range and the wall, in which case the distance may be not less than 3½ inches. Such shield shall consist of No. 24 United States Standard gauge sheet metal, securely fastened to the wall by thimbles or other suitable spacers and providing at least a one-and-one-half inch clearance between the shield and the wall. This shield shall extend to the floor and at least 6 inches beyond the back, side, top of high shelf or any other part of the range and the space between the shield and wall shall be open at least on one side and top. Where a range is installed without a high shelf, the combustible walls adjacent to the cooking top section of such range shall be protected as indicated for a distance of at least 24 inches above the surface of the cooking top.

Vent pipes installed through or adjacent to combustible walls or ceilings shall be subject to the regulations for smoke pipes in Paragraph 9482.

Water heaters shall be located so as not to constitute fire hazards to persons or property. A distance of at least 6 inches shall be maintained from combustible construction located on the side above the top of any such water heater.

Stoves

Par. 9475. All stoves for heating, cooking or laundry purposes using solid or liquid fuel when resting on wood floors, except such stoves having legs at least 18 inches high and except stoves burning kerosene and like fuel, shall be securely supported at least 6 inches above such wood floors by metal supports and there shall be a sheet metal and asbestos pad at least three-eighths inch thick below such stove extending at least 6 inches on each side and at least 12 inches in front of such stove. Such stoves shall not be placed nearer than 6 inches to any wood partition or other combustible material, and if placed more than 6 inches but less than 12 inches from any such wood or other combustible material, such wood or other combustible material shall be protected with a metal or asbestos shield supported one inch from the combustible material and extending 12 inches beyond and above the stove. Other incombustible material equally valuable as a heat insulator may be used in place of the metal or asbestos shield.

There shall be at least 3 feet clearance between all stoves and any wood or other combustible material above such stoves. All stove installations except oil burning stoves and kerosene cooking stoves with supply tanks of 2 gallons or less capacities shall be connected by a smoke pipe to a chimney meeting the requirements of Paragraph 9482.

Tanks supplying kerosene stoves directly by gravity shall not exceed 6 gallons capacity and tanks which are an integral part of any stove shall not exceed 10 gallons capacity. Tanks of the inverted bottle type shall not exceed 3 gallons and not more than 2 such tanks shall be connected to a single heating unit. Tanks of the inverted bottle type shall be located not less than 2 feet from the device in which the burner is installed, unless protected by a shield.

Fireplaces

Par. 9476. All fireplaces designed to burn solid fuel shall be constructed of masonry supported from the ground or upon masonry, reinforced concrete or steel construction. The thickness of backs and sides of such fireplaces shall be at least 8 inches of brick or 12 inches of stone up to a point where flue lining commences, above which the construction shall comply with all requirements for masonry chimneys. Every such fireplace shall have a separate and distinct flue having a net area of not less than that required in Paragraph 9481. No wood or other combustible material shall be permitted to enter the required thickness of masonry around any fireplace or flue.

The joints between the face brick or tile used for the mantel facing of any fireplace shall be flushed solid with mortar.

The hearth of any fireplace shall be at least 20 inches wide measured from the outer face of the masonry and shall extend at least 16 inches on each side of the fireplace opening. The hearth shall be of brick, flat stone or concrete or other similar incombustible materials at least 4 inches thick supported directly on incombustible construction, and no wood shall be left under the hearth.

Every fireplace using heating appliances for which natural or artificial gas is used as fuel shall be provided with a suitable flue, meeting the requirements of Paragraph 7848 and 9467, except that if such appliances are approved for use as unvented space heaters, no flues shall be necessary.

Space Heaters and Other Miscellaneous Fuel Burning Appliances

Par. 9478. Space heaters shall not be installed in closed rooms if under test conditions, the combustion of an amount of fuel liberating 20,000 Btu in a one-thousand cubic foot air-tight room with no air changes occurring during such combustion, the concentration of carbon-monoxide in the atmosphere is in excess of 0.05 per cent.

No flues shall be required on space heaters.

Gas fired clothes driers installed in Public or Private Assembly buildings, Institutions, or Dwellings containing four or more apartments, and subjected to public or semi-public use, shall be equipped with an approved ignition-failure shut-off device.

Other miscellaneous fuel burning appliances shall be safely installed according to the requirements of the Buildings Engineer.

Acetylene Gas Systems

Par. 9479. All acetylene gas generators used in the City of Baltimore shall be designed and constructed so as to meet the approval of the Buildings Engineer and shall not be used at a higher rating than that specified by the manufacturers thereof.

Generators, if located inside of buildings, shall be in rooms not used for other purposes and constructed as required for highly hazardous manufacturing rooms in Paragraph 4843. Rooms containing generators shall have a vent connection to the outer air and shall have no open flames in them.

Containers used for the storage of acetylene gas shall be in accordance with the Interstate Commerce Commission Specifications for handling and storing acetylene. Where such containers not in actual use have a total capacity in excess of 2000 cubic feet, they shall be stored in rooms constructed as required for highly hazardous storage rooms in Paragraph 4743, or shall be placed in the open or in a special storage building used for no other purpose. When located in a building and such containers are connected to a header such containers shall be limited to a total capacity of 2000 cubic feet, except where the headers are located in separate rooms constructed as required in Paragraph 4743, or the headers are placed in a special building used for no other purpose. Rooms containing headers or acetylene containers shall be well ventilated and shall have no open flames in them.

All manifolds and leads to such containers in Industrial systems for acetylene gas shall be capable of withstanding a test pressure of 1000 pounds per square inch after assembly.

Headers for acetylene gas in industrial systems shall be constructed of double extra heavy piping not exceeding one- and one-quarter inch pipe size. Fittings in headers shall be extra heavy. Headers shall be provided with shut-off valves at each point where cylinders are to be connected. Leads from header valves to acetylene container valves shall be constructed of steel tubing, block tin or an approved composition pipe. Approved flash arresters shall be inserted between each cylinder and each header valve.

The discharge opening from the header shall be equipped with an approved regulator so adjusted that acetylene at a pressure in excess of 15 pounds per square inch will not be delivered to an industrial supply piping system.

A flash arrester of the low pressure type or a suitable hydraulic seal shall be installed between the regulator at the discharge of the header and the industrial supply piping.

Where a system of industrial piping is supplied with acetylene from containers connected to a header, an approved service regulator or hydraulic seal shall be used at every point in the piping system where acetylene is drawn off to supply a blow-pipe torch or other gas consuming device.

Copper tubing, piping and fittings shall not be used in any acetylene gas system.

Piping for acetylene gas shall consist of at least standard iron or steel pipe and fittings. Joints shall be welded or made up with substantial threaded fittings. Outside or underground piping shall be suitably protected against corrosion and freezing. Connections from such gas generators to service pipes shall be made with right and left thread nipples or long thread nipples with locknuts or approved unions. Outside piping connecting such gas generators with buildings shall be so graded that condensation will drain back into the generators. Where this is not possible a drip shall be provided at the lowest point of the piping to receive the condensation and shall be so constructed as to permit the draining or pumping out of the accumulated condensation at necessary intervals. Outside piping shall be run as directly as possible and shall be carefully protected against injury and laid so that the pipes are pitched to the low point without sags. Proper allowance shall be made for expansion and contraction, jarring and vibration. Pipes leading to the ground surface shall be cased or jacketed where necessary to prevent loosening or breakage.

Inside piping as far as possible should be arranged so that any moisture will drain back to the supply pipe. If low points occur of necessity in any piping, they shall be drained through tees into drip cups permanently closed with screw caps or plugs. No pet cocks shall be used.

The pipes from such gas generators to fixtures or appliances shall in no case be smaller than three-eighths-inch size, except, when such pipe is a part of the fixture or appliance. Larger sizes shall be used where recommended by the manufacturer of the equipment.

Piping for cooling or lighting appliances shall be tested, with all outlets capped before fixtures are attached with air under a pressure of 3 pounds per square inch, which pressure shall be maintained without a detectable drop thereof, for a period of at least 30 minutes. After fixtures are attached and the piping is connected to the gas generator, a second test shall be made at one pound per square inch which pressure shall be maintained without a detectable drop thereof for a period of at least 30 minutes.

SECTION 948

FLUES, BREECHING, SHIELDS AND GUARDS

Flues

Par. 9481. Every heating apparatus or heat producing appliance, except electric heating appliances and as otherwise provided in Section 946 for gas appliances, shall be connected to a flue. Flues for the stationary type of Class A incinerators shall meet the requirements of Paragraph 9471.

The short dimension of the cross-section of a flue shall be not less than two-thirds the long dimension.

All flues shall have cleanout facilities.

The flues for ordinary heating devices burning solid fuel shall have a minimum effective area of not less than the following:

Small special stoves and heaters....	28 square inches
Stoves, ranges and room heaters....	40 square inches
Fireplaces................	At least 1/12 the fireplace opening, but not less than 50 square inches.
Warm air domestic furnaces.......	70 square inches

All natural draft flues for steam or hot water heating plants, except for gas-fired boilers or heaters, shall conform to the following minimum requirements as to size and height:

TABLE 9481T

Steam Boiler Capacity Square Feet of Radiation or Less	Hot Water Heater Capacity Square Feet of Radiation or Less	Rectangular Flue Actual Area in Square Inches	Circular Flue Actual Area in Square Inches	Height in Feet Above Grate
590	973	81		35
690	1,140		79	
900	1,490	110		
1,100	1,820		113	40
1,700	2,800	183		
1,940	3,200		177	
2,130	3,520	248		
2,480	4,090	298		45
3,150	5,200		254	50
4,300	7,100		314	
4,600	7,590	357		
5,000	8,250	441		55
5,570	9,190	576		60
5,580	9,200		380	
6,980	11,500		452	65
7,270	12,000	672		
8,700	14,400	784		
9,380	15,500		573	
10,150	16,750	900		

Chimneys and flues shall be constructed as required in Sections 784 and 492.

For oil burning domestic heating plants in buildings not over 30 feet in height, the minimum height of flues as given in Table 9481T may be reduced not more than 40 per cent where the capacity square feet of radiation does not exceed 1700 square feet for Steam Boilers or 2800 square feet for Hot Water Heaters.

Smoke Pipes

Par. 9482. All smoke pipes shall be as short and straight as practicable and shall have a cross-sectional area at least equal to that of the manufacturers' standard smoke box collar for the furnace and as approved by the Buildings Engineer. Portable Class A incinerators and appliances using long flaming fuels or producing a flue temperature in excess of 500 degrees Fahrenheit, except Class B and C incinerators, shall be connected with smoke pipe of black or galvanized iron not thinner than No. 24 United States gauge or of masonry. Every smoke pipe shall fit tightly into the side of the chimney in which it is fitted. The smoke pipe of those appliances which do not produce a flue temperature as high as 500 degrees Fahrenheit shall be as required above or of other incombustible material such as copper, terneplate, transite, or similar material. No wood or other combustible material shall be permitted within 12 inches of any smoke pipe, except as permitted below, and all combustible material within 18 inches of any smoke pipe shall be covered with a shield which shall be not less in width than twice the diameter of the smoke pipe and of sufficient length to cover the combustible material. When smoke pipes enter chimneys that are furred and plastered there shall be a 4-inch firestop of masonry or mortar between the smoke pipe and any combustible lath, furring or similar material.

Smoke pipes may be extended through combustible partitions, walls, roofs, or floors, provided that they are protected as follows:

a. On smokepipes with a surface temperature of 160 degrees Fahrenheit or less, a thimble shall be used to provide a one-inch clearance from the combustible material.

b. For surface temperatures over 160 but less than 500 degrees Fahrenheit, a ventilated metal collar and sleeve around the collar shall be provided to give a total of 6 inches clearance on all sides when going through a roof or floor and 4 inches clearance on all sides when going through a partition or wall.

c. For surface temperatures of 500 degrees Fahrenheit or more, passages through roofs, floors or walls shall be guarded by a galvanized iron ventilating thimble. Where the smokepipe passes through a roof, such thimble shall extend not less than 9 inches below and 9 inches above such roof. Thimbles shall be of a size providing a clearance on all sides of the smokepipes not less than 18 inches.

When smoke pipes pass through floors, they shall be heat insulated for at least 8 feet above the floor.

Regulations for smoke pipes of Class B and C incinerators are included in Paragraphs 9472 and 9473.

Breeching

Par. 9483. No breeching shall have long horizontal runs and in no case shall this run drop below the horizontal. All breeching shall be provided with clean-out openings, with tightly fitted doors, so that all parts of the breeching can be cleaned.

Shields

Par. 9484. Shields shall consist of asbestos millboard not less than three-eighths inch thick; masonry or reinforced concrete walls not less than 3 inches thick; sheet metal not less than No. 24 United States Standard gauge, properly supported; or other incombustible material meeting the approval of the Buildings Engineer.

All shields shall have a ventilated air space on both sides of not less than 3 inches, except where otherwise required or permitted.

Dampers

Par. 9487. Dampers shall not close entirely the chimney uptake. The damper area shall be carefully determined in each case but in no case shall it exceed 80 per cent of the internal cross-sectional area of the uptake.

Dampers for oil burning systems shall be open at the time the oil is being ignited.

No damper shall be provided in any part of the vent or flue pipe between a gas appliance and a chimney, except on industrial ovens, furnaces, air heaters or other industrial equipment when such dampers are necessary to the normal operation of the equipment.

CHAPTER 95

HEATING AND VENTILATING SYSTEMS

Sec. 950—General Requirements for Heating and Ventilating Systems.
Sec. 951—Steam and Hot Water Heating Systems.
Sec. 952—Gravity Warm Air Heating Systems.
Sec. 953—Mechanical Warm Air Heating Systems.
Sec. 954—Gravity Ventilating Systems.
Sec. 955—Mechanical Ventilating Systems.
Sec. 956—Dust and Vapor Removal Systems.
Sec. 957—Air Conditioning Systems.
Sec. 958—Heat and Vent Ducts.
Sec. 959—Maintenance and Operation of Heating and Ventilating Systems.

SECTION 950

GENERAL REQUIREMENTS FOR HEATING AND VENTILATING SYSTEMS

Scope of Heating and Ventilating Systems

Par. 9500. These regulations constitute the minimum requirements for the design, construction, installation, operation and maintenance of steam, hot water, gravity and mechanical warm air heating systems, gravity and mechanical ventilating systems, dust or vapor removal systems and air conditioning systems, wherever such systems are installed or operated.

The requirements for the furnaces, heaters, boilers and chimneys used in connection with the aforesaid systems are included in Chapters 93 and 94 and for the refrigeration for air conditioning, in Chapter 96.

Definitions of Heating and Ventilating Terms

Par. 9501. The definitions given here apply only to terms used in connection with Chapter 95:

Combined Heating Systems shall mean any installation in which two or more systems are used simultaneously to heat a building or group of buildings.

Damper shall mean a device for the checking or regulating of air flow.

Diffuser shall mean a vaned device placed at an air supply or inlet opening to direct the air flow.

Exhaust shall mean the final discharge of air, vapor or dust.

Grille shall mean a perforated covering for an air inlet or outlet.

Indirect System shall mean a mechanical warm air heating system, wherein the circulating air is heated by contact with coils or radiators containing low pressure steam or hot-water.

Inlet shall mean the opening within a building through which the air is discharged from a duct into the room or area to be heated or ventilated.

Intake shall mean the opening in an exterior wall or roof through which the outside air is admitted to the heating or ventilating system.

Louver shall mean an opening fitted with overlapping slats as a protection against weather, as a sight-break, or as an air directive.

Outlet shall mean the opening within a building through which the air, vapor or dust is discharged from the room or area into the exhaust duct.

Plenum shall mean an air compartment maintained under pressure and connected to one or more distributing ducts.

Receptacle shall mean a portable container to receive the discharge of dust, refuse or flyings collected by dust removal systems.

Register shall mean a grille with a built-in damper or shutter.

Register Box shall mean the metal housing of a register.

Separator shall mean a room or compartment into which dust and refuse accumulations are discharged from the duct system wherein separation and reclamation are affected automatically.

Vault shall mean a fixed receiver for use in connection with dust removal systems.

Classification of Heating and Ventilating Systems

Par. 9502. Heating systems are divided into:

a. Steam or hot water heating systems.
b. Gravity warm air heating systems.
c. Mechanical warm air heating systems.
d. Combined heating systems.

Ventilating systems are divided into:

a. Gravity ventilating systems.
b. Mechanical ventilating systems.
c. Air conditioning.

Permits for Heating or Ventilating Work

Par. 9503. No person shall install or make an alteration to any heating, ventilating, or air conditioning system without first filing an application with, and obtaining a permit therefor from, the Buildings Engineer, as required in Chapter 13 and Chapter 14.

Drawings of Heating or Ventilating Systems

Par. 9504. Drawings or diagrams and specifications of all heating, ventilating or air conditioning systems, shall be submitted as required in Chapter 13.

Inspection and Tests of Heating and Ventilating Systems

Par. 9507. Upon completion of a heating, ventilating or air conditioning installation, the Buildings Engineer shall be notified, by the person or persons responsible for the performance of such work, that it is ready for inspection or test.

Existing Heating and Ventilating Systems

Par. 9508. Existing heating and ventilating systems which do not conform to the provisions of Chapter 95 of this Code shall be made to conform thereto when they are renewed or reconstructed or at any time if such heating or ventilating systems create or tend to create an imminent hazard to life or property.

Alterations, Repairs and Replacements for Heating and Ventilating Systems

Par. 9509. Alterations, additions and replacements made to an existing heating or air conditioning system or plant, in or for any building, shall be in conformity with the requirements of this Code in so far as any such alterations, additions or replacements may be deemed practicable by the Buildings Engineer.

Any steam or hot water boiler, warm air furnace, fan, blower of any heating or ventilating system, or any appurtenance connected thereto or therewith, which is installed to replace any existing equipment of like nature in any existing plant or system shall be of such capacity as is required under this Code.

Repairs to any heating or ventilating equipment shall be made in such manner as to restore such equipment, as near as is practicable, to its original sound condition. Such repaired equipment shall be subjected to such tests as may be required by the Buildings Engineer.

SECTION 951

STEAM AND HOT WATER HEATING SYSTEMS

Scope of Steam and Hot Water Heating Systems

Par. 9510. Steam and hot water heating systems, in this Code, shall mean and include systems in which steam, vapor or hot water is conveyed in pipes or tubing from a boiler or heater to coils or radiators located in the rooms to be heated, which coils or radiators distribute the heat through such rooms mainly by radiation and convection.

Heating systems complete include the heating boiler. However, in this Code, the boiler and its trimmings, accessories and breaching are separately regulated in Chapter 93 and Chapter 94, and the term "heating systems" in this Code shall include all work and materials starting at the boiler tappings and extending to the farthest radiation in the system.

The parts containing steam or hot water of an indirect system shall be in accordance with the regulations of Section 951.

Pressure in Steam and Hot Water Heating Systems

Par. 9511. The operating pressure in the pipes and radiators of steam and hot water heating systems shall in no case exceed:

For steam systems........15 pounds per square inch
For hot water systems....30 pounds per square inch

Construction of Steam or Hot Water Heating Piping

Par. 9512. All steam or hot water heating pipes, fittings and valves shall be at least of standard weight.

All connections of such pipes and fittings shall be made tight to prevent leakage.

All piping used in steam or hot water heating systems shall conform to the following specifications:

"Standard Specifications for Welded Wrought Iron Pipe" of the American Society for Testing Materials, Serial designation A72-39.

"Standard Specifications for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe" of the American Society for Testing Materials, Serial Designation A120-36.

"Specifications of the American Water Works Association, 1908", for cast iron pipe.

"Standard Specifications for Copper Water Tube" of the American Society for Testing Materials, Serial Designation B88-39.

All steam and hot water pipes shall be firmly supported for their full length at such intervals that no dislocation of the pipes may occur.

Location of Steam or Hot Water Heating Pipes

Par. 9513. Unprotected steam or hot water pipes shall not be placed nearer than one inch to any unprotected woodwork or other combustible materials. Provided, however, that unprotected steam or hot water pipes of plants which are automatically controlled so that the temperature of the pipes of such plants cannot exceed 220 degrees Fahrenheit, may be placed not less than one-half inch from any unprotected wooden or other combustible materials.

All steam or hot water pipes piercing floors or lath and plastered partitions, shall be protected by a closed metal sleeve one inch larger in diameter than the pipe, except that such sleeves may not be required where the heat in such pipes is automatically controlled so that the temperature of the pipes can not exceed 220 degrees Fahrenheit.

No concealed hot water heating pipes shall be located in an outer wall of any wood-frame building, unless properly protected against freezing.

Covering of Steam or Hot Water Heating Pipes

Par. 9514. All coverings and insulation used on steam or hot water heating pipes shall be of incombustible material.

Where such insulating covering is subject to damage or abuse, sheet metal protective wrapping shall be used of at least No. 26 U. S. Standard gauge, substantially banded in place.

All steam or hot water heating pipes which pass through stock shelving shall be covered with a low-conducting material, at least three-quarters of an inch thick.

Where heating pipes are subject to contact by the public, proper protection shall be provided.

Expansion of Steam or Hot Water Heating Pipes

Par. 9515. Steam or hot water pipes shall be so installed that the effect of expansion and contraction shall not damage the system.

Radiators

Par. 9516. Where radiators or coils are placed in wooden recesses or boxes, such boxes or recesses shall be lined with not less than one-half inch of asbestos or similar low-conducting incombustible material. The top of the radiators or coils shall be not closer than two inches from the inner surface of such recesses or boxes.

No coils or radiators shall be installed in aisles or passageways of Public or Private Assembly buildings, or Industrial buildings; however, such radiators or coils may be placed in recesses in such a manner that no parts of the radiators or coils will project into the aisles or passageways.

Where radiators or coils are installed within two and one-half feet of fixed seats in a Public or Private Assembly building, such radiators shall be provided with suitable incombustible shields to protect the occupants of the seats from direct radiant heat.

Radiators shall rest evenly on four or more legs, integral with each unit, and remain in perfect balance. Where the ratio of width to height exceeds 1 to 6, the radiator shall be secured on top to the adjacent construction.

Wall hung radiators shall be mounted on substantial hangers securely bolted into the wall construction.

Safety or Relief Valves in Steam and Hot Water Heating Systems

Par. 9517. Every closed hot water heating system shall be equipped with a pressure relief valve so adjusted that it will open at a pressure slightly higher than the normal operating pressure, and below the limit of operating pressure stated in Paragraph 9511.

Every system designed for a pressure lower than the operating pressure of the boiler shall be equipped with either safety or relief valves, set below the limit of operating pressure stated in Paragraph 9511.

SECTION 952

GRAVITY WARM AIR HEATING SYSTEMS

Scope of Gravity Warm Air Heating Systems

Par. 9520. Gravity warm air heating systems, in this Code, shall include every heating system in which warm air is conveyed in pipes or ducts by gravity to the rooms to be heated, the air being heated in plenum chambers or hoods by furnaces or steam coils located in rooms, other than those to be heated.

Air Intakes and Ducts for Gravity Warm Air Heating Systems

Par. 9521. Fresh air intakes for gravity warm air heating systems shall be located in an exterior wall, and all fresh air shall be taken entirely from the outside.

All fresh air intakes shall be protected by not less than one and one-quarter inch nor more than one and one-half inch mesh metal screens protected against corrosion.

All fresh air and return air ducts shall be as required for such ducts of mechanical warm air heating systems in Paragraph 9534.

All warm air ducts shall be of incombustible materials.

In all other respects, ducts shall be constructed as required in Section 958.

Limit Control on Gravity Warm Air Furnaces

Par. 9522. Gravity warm air furnaces using gas, oil, or stoker-fired coal as fuel shall be provided with an automatic temperature control acting on the fuel supply which will effectively prevent the temperature of the warm air leaving the plenum chamber from exceeding 250 degrees Fahrenheit at any time.

Such temperature control devices shall have the approval of either the Underwriters' Laboratories, Incorporated, or The American Gas Association, for the purpose for which they are required.

Location of Warm Air Registers

Par. 9525. In Public and Private Assembly buildings, no floor registers shall be installed in aisles or passageways except in churches or club houses. No dimension of registers in such aisles or passageways shall be greater than 18 inches.

Floor registers installed in any building shall be able to support a live load for which the floor is designed, as required in Section 603.

Construction of Warm Air Registers

Par. 9526. All warm air registers shall be constructed of incombustible materials.

Warm air registers installed in woodwork or combustible floors shall be surrounded by an incombustible border not less than one inch wide.

There shall be at least one register in every warm air heating system without louvers or dampers and the pipe or duct connecting it with the furnace shall have no dampers.

Warm Air Register Boxes

Par. 9527. All warm air register boxes shall be constructed of bright tin or galvanized iron of the same thickness as required for ducts in Paragraph 9582.

Warm air register boxes installed in combustible floors or partitions, except those directly over the furnace, shall be constructed with either double walls with at least one-half inch space between the walls of the box, or shall be covered with asbestos paper weighing at least 12 pounds per 100 square feet, in which latter case they shall have a clear space of at least five-sixteenths inch around them.

When a warm air register box is installed in a combustible floor directly over a furnace with warm air pipes, there shall be an open space of at least 2 inches around the register box. Such distance for pipeless furnaces shall not be less than 4 inches, unless surrounded by a cold air return passage.

SECTION 953

MECHANICAL WARM AIR HEATING SYSTEMS

Scope of Mechanical Warm Air Heating Systems

Par. 9530. Mechanical warm air heating systems, in this Code, shall include every system where the warm air is conveyed by mechanical draft in pipes or ducts to the rooms to be heated or dispersed directly by fans placed in the rooms. The air may be heated in plenum chambers or hoods by furnaces, or steam coils, located in rooms other than those to be heated or, as in indirect systems, the air may be heated by steam coils, radiators, or similar heating units placed in the rooms.

The incorporation into or addition to a mechanical warm air heating system of air washers, filters, humidifiers, cooling coils or other similar appurtenances for conditioning the circulated air shall not change the classification of the system if it otherwise conforms to the above definition and the installation of such appurtenances does not interfere with the operation of the system or the safety controls as hereinafter specified.

Warm Air Ducts, Intakes and Outlets for Mechanical Heating Systems

Par. 9532. The warm air distribution ducts, boxes, outlets and inlets of a mechanical warm air heating system shall be constructed of metal or other approved hard, durable incombustible materials. Where such parts of the system are made of iron or steel, the material shall be galvanized or otherwise effectively protected against corrosion.

Warm air registers and register boxes shall be constructed and located in accordance with the requirements in Section 952.

Fresh air intakes shall be located outside of the building.

In all other respects, ducts and fixtures thereto shall be in accordance with the applicable regulations of Section 958.

Insulation in Mechanical Warm Air Heating Systems

Par. 9533. In a mechanical warm air heating system, that portion of the plenum chamber or trunk line immediately above the furnace outlet shall not be less than 2 inches from any combustible material, unless such chamber or trunk line is covered with at least one-quarter inch of asbestos mill board, or other incombustible low-conducting material approved by the Buildings Engineer.

Return Ducts for Mechanical Warm Air Heating Systems

Par. 9534. All fresh air and return air ducts in a mechanical warm air heating system shall be of incombustible materials, except that in dwellings with 3 apartments or less, or other dwellings housing 15 persons or less, such ducts may be of combustible materials if they satisfy the requirements of Paragraph 9534.

Where the space between wood studs and joists is utilized for return air ducts, or where ducts are made of wood or other suitable combustible material, no wood thinner than one-inch nominal thickness and no material more flammable than one-inch wood shall be used. Combustible return ducts shall not extend or be used within 6 feet of a heating furnace or blower, and all ducts within such distance shall be of incombustible materials and constructed as required in Section 958.

No air return shall be permitted from any unfinished section of a basement or cellar, or from a toilet room or rooms containing gases which are obnoxious or injurious to health. All fresh air intake or return ducts carried underground or below the basement or cellar floor shall be made of vitrified tile, cast iron or concrete, as required in Paragraph 9582.

Controls and Regulators for Mechanical Warm Air Heating Systems

Par. 9535. Mechanical warm air heating systems shall be equipped with automatic controls, as hereinafter defined and specified, capable of regulating the operation of the system within the designated temperature limits. Such systems shall not be operated if any of the required controls are not installed. Such systems shall be permanently set and maintained at temperatures not in excess of those hereinafter specified for each such control. Provision shall be made for manual operation of the equipment for a short time until inoperative or defective controls can be repaired or replaced. All controls and regulators shall be such as are approved by the Underwriters' Laboratories, or approved by the Buildings Engineer, for the purpose for which they are required. All controls shall be so installed as to be readily accessible for inspection. All adjustable controls shall be calibrated to show the various temperature settings allowed or required herein, while non-adjustable controls shall have the temperatures at which they operate indicated on the control in a conspicuous manner.

Direct-fired air heaters in mechanical warm air systems which are automatically controlled from a house thermostat shall be equipped with an automatic device to limit the air temperature in the furnace bonnet or at the beginning of the main supply duct. Such automatic device shall be so constructed that it cannot be set higher than 250 degrees Fahrenheit, but it shall never be set higher than 225 degrees Fahrenheit.

In mechanical warm air heating systems, an automatic control shall be provided to start the fan whenever the temperature of the air in the furnace bonnet or at the beginning of the main supply duct reaches 175 degrees Fahrenheit.

A gas pressure regulator shall be installed in the case of all gas fired furnaces, and shall be vented to the pilot in the combustion chamber or to the outside of the building.

A thermostatic pilot shall be provided on all gas burners, so constructed and adjusted as to prevent the flow of gas through the main burner unless the pilot flame is burning.

A limit control shall be provided on all indirect warm air heating systems. The limit control shall be governed by the pressure of steam in the system or the temperature of the air in the plenum chamber. In either case the character, operation and setting of the limit control shall be such as to prevent the temperature of the air in the plenum chamber from exceeding 200 degrees Fahrenheit at any time. A blower or fan control shall not be required. Where gas is used for fuel a gas pressure regulator, a gas valve limit control and a thermostatic pilot shall be provided.

Location of Unit Heaters

Par. 9536. Where unit heaters are installed in airplane hangars, garages or buildings in which flammable liquids are handled, such heaters, including their motors, shall be of the explosion-proof type.

No unit heaters of the open flame or direct fired type shall be located in rooms containing flammable vapor.

SECTION 954

GRAVITY VENTILATING SYSTEMS

General Requirements for Gravity Ventilating Systems

Par. 9540. Gravity ventilating systems shall include every system in which fresh air is conveyed to, and the vitiated air is removed from, the rooms to be ventilated, in ducts or flues by gravity. In gravity ventilating systems, where heating coils are installed to accelerate the draft in the ducts, the temperature of the air in such ducts shall never exceed 150 degrees Fahrenheit.

Ducts in Gravity Ventilating Systems

Par. 9545. All ducts in gravity ventilating systems shall be constructed of materials which are not more combustible than one-inch wood boards.

In all other respects, ducts shall be in accordance with the requirements of Section 958.

The ducts from toilet rooms, and rooms containing obnoxious gases, or gases injurious to health, shall not be connected into the ducts from other rooms, but shall be terminated in a separate exhaust.

SECTION 955

MECHANICAL VENTILATING SYSTEMS

Scope of Mechanical Ventilating Systems

Par. 9550. Mechanical ventilating systems shall include every system in which fresh air is conveyed to, and every system in which vitiated air is removed from, the rooms to be ventilated in ducts or flues by enforced or induced draft or the combination of such systems.

Outdoor Air Intakes in Mechanical Ventilating Systems

Par. 9551. All outdoor air intakes in mechanical ventilating systems shall be as required in Paragraph 9583.

Air Inlets and Outlets in Mechanical Ventilating Systems

Par. 9552. Registers and screens protecting the inlet or outlet openings of mechanical ventilating systems shall be made of incombustible material.

Exhaust Air Outlets in Mechanical Ventilating Systems

Par. 9554. For regulations governing exhaust air outlets in mechanical ventilating systems, refer to Paragraph 9584.

Ducts in Mechanical Ventilating Systems

Par. 9555. All ducts in mechanical ventilating systems shall be of incombustible materials, except that in dwellings containing less than 4 apartments or other dwellings housing 15 persons or less, they may be of materials which are not more combustible than one-inch wood boards.

The ducts from toilet rooms, rooms containing obnoxious gases and gases injurious to health, shall not be connected into the ducts from other rooms, but shall be terminated in separate exhausts.

For other regulations governing ducts, refer to Section 958.

Fans for Mechanical Ventilating Systems

Par. 9557. All exposed openings in the fan housing or casing of mechanical ventilating systems shall be protected with substantial metal screens.

Belt and chain drive guard requirements are in Paragraph 9215.

Air Filters in Mechanical Ventilating Systems

Par. 9558. Air filters in mechanical ventilating systems shall be of a type that will not burn freely or emit large volumes of smoke or other obnoxious gases when ignited.

The liquid adhesive coating used in air filters shall have a flash point of not lower than 350 degrees Fahrenheit, when tested in the Cleveland open cup.

Where filters are flushed with a liquid adhesive flowing through the air stream, the system shall be so arranged that the filter may not be flushed while the fan is in operation.

For maintenance of filters, refer to Paragraph 9592.

SECTION 956

DUST AND VAPOR REMOVAL SYSTEMS

Scope of Dust and Vapor Removal Systems

Par. 9560. Dust and vapor removal systems include every system in which dust, refuse, flyings or inflammable vapors are conveyed from rooms in ducts or flues by induced or enforced draft.

Outlets for Dust and Vapor Removal Systems

Par. 9561. Outlets for suction ducts for dust and vapor removal systems shall be placed so as to collect dust or vapors at their source.

Exhausts for Dust and Vapor Removal Systems

Par. 9562. Exhausts for dust and vapor removal systems shall not be located within 5 feet of any combustible material or structure.

In other respects, exhausts shall be as required in Paragraph 9584.

Vents for Dust Removal Systems

Par. 9563. All dust removal systems shall be vented to the outside of any building. Vents shall be connected directly to the ducts or to the vaults, receptacles or separators into which the ducts discharge. Such vents shall be of the safety relief type on all systems conveying explosive dust or refuse. Safety vents connecting to ducts shall be at least of the same size as such ducts, and they shall follow the shortest possible line out of the building. Vents shall not be connected into chimneys or ducts used for other purposes.

Exhaust openings of all vents shall be equipped with a metal screen of a mesh which will prevent the entry of sparks. Metal screens on safety relief vents shall not be fixed.

Where the safety relief vent openings are covered, such covers or hoods shall be so constructed that they will easily open in case of explosion.

Ducts for Dust and Vapor Removal Systems

Par. 9564. Ducts in dust or vapor removal systems shall be constructed of incombustible materials at least equal in strength and durability to galvanized iron or steel sheets of a thickness as required in Paragraph 9582.

All bends, turns or elbows of ducts in a dust removal system shall have a radius on the center line at least equal to one and one-half times the dimension of the duct in the plane of bending.

Where ducts of dust removal systems, except trunk line ducts conveying explosive materials, pass through or are located in combustible floors, or walls, a clearance of at least one-half inch shall be maintained around the ducts, or one-quarter inch asbestos sheeting shall be placed between the duct and the combustible materials.

Trunk line ducts conveying explosive materials and all ducts conveying flammable vapors shall have a clearance of at least 6 inches between such ducts and combustible materials.

Ducts of vapor removal systems shall not be concealed in walls or partitions.

No screens or other obstructions shall be placed in ducts of dust removal systems.

All metal ducts, fan casings, and other metal parts of systems conveying flammable vapors, combustible dust or refuse, shall be electrically grounded in a manner as required in Chapter 86.

In all other respects, ducts and fixtures thereto shall be in accordance with the applicable regulations of Section 958.

Fans in Dust or Vapor Removal Systems

Par. 9566. All exposed openings on the fan housing or casing of a dust or vapor removal system shall be protected with substantial screens.

Where flammable vapors or materials, or readily ignitible stock, are passed through the fan of a dust or vapor removal system, the blades, the spider, the casing and the lining of such fan shall be constructed of nonferrous material.

The bearings of fans in dust or vapor removal systems shall not project into the casing of such fans or into the ducts.

All fans shall have a remote control switch or other stopping device located in rooms other than that where the fan is installed.

Where fans are located in rooms from which flammable dust is removed, and the power for such fans is transmitted from motors located outside of such rooms by shafts, belts, chains, and similar devices, such transmissions shall be enclosed for their whole length. This enclosure shall be constructed dust-tight of a substantial incombustible material.

Separators, Receptacles and Vaults in Dust Removal Systems

Par. 9567. Separators used with dust removal systems shall be located outside of any building. Such separators and their supports shall be constructed of incombustible materials. Separators located within 10 feet of any combustible construction shall be equipped with a vent terminating above the highest roof located within 10 feet of such vent. Such vents shall be constructed as required in Paragraph 9563.

Where refuse is to be burned, it shall not be conveyed from separators directly into fire boxes or furnaces utilizing forced draft, but shall be discharged from the vaults at the separators by means of conveyors into feed magazines at each fire box or furnace. Such conveyors shall be so constructed that any back flash from the magazine into the vaults will be effectively prevented. All conveyors used to discharge refuse from feed magazines into the fire box or furnace shall be so constructed as to prevent any back flash from the fire box or furnace into the magazine. Where the separator is equipped with a vent, the outlet on the vent shall be located not higher than the top of the chimney serving fire boxes or furnaces utilizing forced draft. All feed magazines shall be equipped with a safety relief vent.

All vaults used for the storage of combustible dust or refuse shall be located outside of the building. Such vaults shall be constructed entirely of incombustible materials. The entrances to these vaults shall be protected with approved automatic fire doors.

Vaults containing explosive materials shall be equipped with safety relief vents located on the roof of the vault. All other vaults shall be provided with screened vents, located on the roof thereof, of a cross-sectional area not less than the total cross-sectional area of all ducts leading into the vault. All vents shall be constructed as required in Paragraph 9563.

Where small refuse receptacles are used, they shall be located outside of any building, if their capacity is more than 18 cubic feet. When located inside of the building, they shall have vents leading directly to the outside air. All small receptacles shall be substantially constructed of incombustible material, not less than No. 18 United States Gauge, if of sheet metal, and in all cases a minimum clearance of 6 inches shall be maintained between vent duct and any combustible material.

Hoods over Cooking Equipment

Par. 9569. Where hoods are desired over cooking equipment to dispose of cooking odors in kitchens, such hoods and the ducts connecting thereto shall be constructed of incombustible material. If constructed of galvanized iron or steel, this shall be at least No. 18 United States Standard Guage.

Where such hoods or ducts are installed through or adjacent to combustible materials, the installation thereof shall conform to the requirements for smoke pipes in Paragraph 9482. Such hoods or ducts shall not be connected to other ducts.

SECTION 957

AIR CONDITIONING SYSTEMS

Scope of Air Conditioning Systems

Par. 9570. Air conditioning systems, in this Code, shall mean systems providing for the control of the temperature, moisture content, motion, distribution and cleanliness of the air within any room, building or habitable enclosure.

Design of Air Conditioning Systems

Par. 9572. Air conditioning systems shall be designed in accordance with the best prevailing engineering practice, and in conformity with the several Sections of this Code pertaining to integral parts of such systems.

Airways for Air Conditioning Systems

Par. 9573. All ducts in conditioned air systems shall be of incombustible materials and shall be in accordance with the applicable requirements of Section 958.

Where the airways or ducts for use in conditioned air systems are used also for warm air ducts, the requirements for each use shall be met in the design and construction thereof.

Water and Drains of Air Conditioning Systems

Par. 9574. All water supply and drain piping of air conditioning systems, and accesories thereto, shall be in accordance with the requirements of the Bureau of Water Supply and of the Health Department.

Air Cleaners and Filters in Air Conditioning Systems

Par. 9575. Where air cleaners and filters are used in air conditioning systems, they shall be in accordance with Paragraph 9558.

Refrigerants for Air Conditioning Systems

Par. 9576. Refrigerants used in conjunction with air conditioning systems shall conform to the requirements of Chapter 96.

The location of refrigerating equipment shall be confined to such areas, space or compartments as required in Chapter 96.

Controls for Air Conditioning Systems

Par. 9577. Each air conditioning system shall be equipped with the necessary approved automatic controls to insure definite, accurate and safe operation.

A main manual switch shall be installed to shut down all mechanical equipment of any air conditioning system, which switch shall be located in a portion of the building which is readily accessible and outside of the room containing such equipment.

Operation and Maintenance of Air Conditioning Systems

Par. 9578. Air conditioning systems shall be kept clean and properly maintained in a safe operating condition.

All parts of such systems shall be readily accessible for inspection and cleaning.

SECTION 958

HEATING AND VENTILATING DUCTS

Scope of Heating and Ventilating Ducts

Par. 9580. This Section includes all heating and ventilating duct systems, complete, from the intake throughout the entire system to and including the final delivery to the atmosphere or other space, together with all appurtenances thereto.

Design of Heating and Ventilating Ducts

Par. 9581. In gravity heating or ventilating systems, all ducts shall be as direct as possible, and shall have a rise in the direction of flow.

Horizontal ducts in gravity heating or ventilating systems shall be avoided wherever possible, but where they are unavoidable, they shall be not less than 20 per cent larger in free area than the required area of the connected vertical runs.

Gravity heating and ventilating systems in which the ratio of the horizontal projections to the vertical projections of all ducts exceeds one to three shall not be permitted.

Elevator and stair shafts shall not be considered or used for ventilation purposes nor shall they be allowed to interfere with the effectiveness of installations.

Construction of Ducts in Heating and Ventilating Systems

Par. 9582. The gauges and construction of sheet metal ducts in heating and ventilating systems shall be appropriate for their specific use and location.

Ducts or airways of wood or other combustible material shall be lined on the inside with sheet metal at the bottom of vertical ducts and at other points where there might be danger from incandescent particles dropped through the register. No duct shall be lined with any material which will support combustion or which will present a rough surface to the flow of air.

The following United States Standard sheet metal gauges shall be considered the minimum for the construction of ducts for the various types of systems:

TABLE 9582T1

AIR DUCTS

Round Ducts		Rectangular Ducts	
Diameter of Ducts in inches	Gauge	Greatest dimension of Duct in inches	Gauge
Up to 14	30	Up to 12	26
14 to 30	26	12 to 30	24*
30 to 40	24	30 to 60	22*
40 to 50	22	60 to 118	20
50 and over	20	118 and over	18

Wall stacks not larger than 3½″x14″ may be 30 gauge.

* May be one gauge thinner if stiffeners angles spaced not over 32 inches center to center are used.

TABLE 9582T2

DUCTS FOR REMOVAL OF FLAMMABLE VAPORS

Greatest Dimension in Inches	Gauge
Up to 20	20
20 to 30	18
30 and over	16

TABLE 9582T3

DUCTS FOR DUST, STOCK AND REFUSE CONVEYING

Greatest Dimension in Inches	Gauge
Up to 8	24
8 to 20	22
20 to 30	20
30 and over	18

All ducts shall be substantially made, smooth on the inside, generally airtight, and shall be maintained in good condition during construction.

All ducts shall be securely stayed and supported to insure permanence and prevent dislocation.

All rectangular ducts having one dimension over 24 inches shall be constructed with standing seams or angles of appropriate size and spacing, or the ducts shall be otherwise reinforced to meet with the approval of the Buildings Engineer.

All ducts with one dimension over 90 inches shall be reinforced with rolled steel angles or other structural shapes of proper sizes and spacing.

Ducts used in connection with kitchen equipment, such as ranges, broilers, hot plates, and similar equipment, where greasy fumes are exhausted, shall be constructed of not less than 18 gauge metal.

Plenum chambers and fan housings shall be constructed of not less than 20 gauge metal and shall be substantially reinforced with standing seams or rolled steel angles or both, except that for domestic heating plants such plenum chambers and fan housings may be constructed of not less than 26 gauge metal.

Underground ducts shall be constructed and equipped as follows:

Thoroughly waterproof.

Graded to insure gravity drainage to a lower receiver.

Without direct sewer connections.

Trunk ducts: with a minimum dimension of 36 inches in the clear vertically and 30 inches horizontally; branch ducts: with a minimum dimension of 24 inches and with a maximum length of 16 feet, and with the top flush with the top of the trunk or main duct.

With substantial and adequate inspection doors and frames, readily accessible for inspection and cleaning purposes, and tight when closed.

Where ducts pass through fire walls, other fire-resistive walls or fire stops, any space around the ducts at such locations shall be sealed tight with an incombustible material.

Ducts shall not be built into a building in such a way as to impair the effectiveness of the fireproofing around steel or iron structural members, such as placing ducts between the fireproofing and the members protected.

Outdoor Intakes in Heating and Ventilating Systems

Par. 9583. Outdoor intakes for heating and ventilating systems, except those for gravity warm air heating systems, shall be located at least 7 feet above a sidewalk or driveway level and not closer than 20 feet from vent discharges, chimneys or similar air-contaminated exhausts, unless permitted by the Buildings Engineer.

Such outdoor intakes which are within 15 feet of another building or within 15 feet horizontally of an adjoining property line, or where required by the Buildings Engineer, shall be protected with automatic approved fire doors or fire shutters.

Such devices shall be constructed as required in Paragraph 9588.

Such intakes shall be suitably protected against weather and water and equipped with substantial screens, all arranged and maintained easily accessible for cleaning. The screens shall be of metal, protected against corrosion, having not less than quarter-inch nor more than half-inch mesh.

Termination of Exhaust Ducts in Ventilating Systems

Par. 9584. All exhaust air outlets of mechanical ventilating systems shall be located either 10 feet above the ground level or in an exterior wall which is not less than 20 feet horizontally from an adjoining property line or street line, except where such locations create a fire hazard or nuisance, in which case the location of such exhaust air outlets shall be approved by the Buildings Engineer. All such exhaust air outlets shall be protected with a metal screen, protected against corrosion, having not less than one-quarter nor more than one-half inch mesh.

Insulation of Ducts in Heating and Ventilating Systems

Par. 9585. Warm air ducts with an average temperature below 200 degrees Fahrenheit or less shall comply with the provisions of Section 953 of this Code. Such ducts with an average temperature of 200 degrees Fahrenheit and over shall not be placed less than 2 inches from any combustible material and if placed less than 6 inches from such material the duct shall be covered with a suitable insulating material not less than one-half inch in thickness.

No covering whose non-conductivity depends upon cork, felt or any other organic matter shall be used on concealed heat ducts carrying air of over 175 degrees Fahrenheit.

Asbestos paper having a weight of less than 12 pounds per 100 square feet shall not be used as air duct insulation.

Dampers and Fire Doors in Duct Systems

Par. 9588. All ducts in mechanical or gravity heating, air conditioning, ventilating, dust or vapor removal systems passing through a fire wall or required occupancy separation wall shall be equipped with approved automatic fire doors on both sides of such walls where the diameter, or the greatest cross-sectional dimension of such ducts at the wall, exceeds 18 inches. Where this dimension or diameter is 18 inches or less, automatic fire doors or fire dampers made of not less than three-eighths inch thick steel shall be installed.

Automatic fire dampers shall be installed in mechanical heating, air conditioning or ventilating systems at the following points:

a. Where such systems serve one story only, at least one in the main supply duct and in the main return duct.

b. Where such systems serve two or more stories, at least one at each direct outlet or inlet on the main vertical duct, and one at each branch duct at its junction with the main vertical duct.

Such fire dampers shall be of metal protected against corrosion and their minimum thickness shall be as follows:

TABLE 9588T

Diameter in Inches or Largest Dimension of Duct	Minimum Thickness United States Standard Gauge
18 or less......................	16
36 or less......................	12
Over 36......................	7

Hinged fire dampers shall be equipped with spring catches and the pins of hinges shall be of non-corroding metal.

SECTION 959

MAINTENANCE AND OPERATION OF HEATING AND VENTILATING SYSTEMS

General Maintenance of Heating and Ventilating Systems

Par. 9590. All heating, ventilating and air conditioning systems shall be maintained in good working order.

Maintenance of Air Filters in Mechanical Ventilating Systems

Par. 9592. All air filters in mechanical ventilating systems shall be kept free of excess dust and combustible material. Unit filters shall be renewed or cleaned when the resistance to the airflow has increased to five times the resistance through a new filter or when it has reached a point equal to 0.5 inch water guage. In filters of the automatic liquid adhesive type, the sludge shall be regularly removed from the liquid adhesive reservoir.

CHAPTER 96

REFRIGERATION

Sec. 960—General Refrigeration Regulations.
Sec. 961—Refrigerants.
Sec. 962—Classification of Refrigerating Systems and Machinery Rooms.
Sec. 963—Use of Groups I and II Refrigerants.
Sec. 964—Use of Group III Refrigerants.
Sec. 965—Use of Groups IV and V Refrigerants.
Sec. 966—Design and Construction of Refrigerating Systems.
Sec. 967—Safety Controls and Devices for Refrigerating Systems.
Sec. 968—Installation of Refrigerating Systems.
Sec. 969—Maintenance and Operation of Refrigerating Systems.

SECTION 960

GENERAL REFRIGERATION REGULATIONS

General Requirements for Refrigeration

Par. 9600. The design, construction, installation, alteration, reconstruction, maintenance and operation of every apparatus or appliance used or intended to be used to extract heat from a material or space by expansion or vaporization of an approved refrigerant, thereby lowering the temperature, commonly called mechanical refrigeration, are included in the regulations of Chapter 96.

Any person, firm or corporation violating any of the provisions of this Chapter shall be subject to the penalties prescribed in Section 192.

Definitions of Refrigeration Terms

Par. 9601. The meaning of words, phrases and terms used in this Chapter shall be as defined in this Paragraph. Such definitions shall apply to refrigeration only.

Air Conditioning System shall mean any equipment used for controlling the temperature, humidity, motion and cleanliness of air within specified limits, in an enclosure.

Branch Header shall mean a fitting joining two or more suction or liquid lines to a common line.

Brine shall mean any liquid used for the transmission of heat without a change in its state, having no flash point or a flash point above 150 degrees Fahrenheit as determined by the "Method of Test for Flash Point by Means of the Tag Closed Tester" of the American Society for Testing Materials, Serial Designation D56-36.

Brine Cooler shall mean an evaporator for cooling brine in an indirect system.

Compressor shall mean any device having one or more pressure imposing elements, serving to increase the pressure of the refrigerant in its gas or vapor state for the purpose of liquefying the refrigerant.

Compressor Relief Device shall mean a valve or rupture member located between the compressor and the stop valve on the discharge side arranged to relieve the pressure at a predetermined point.

Condenser shall mean a vessel or an arrangement of pipes or tubing in which the vaporized refrigerant is liquefied by the removal of heat.

Container shall mean a cylinder or other container for the transportation of refrigerants constructed to conform to the regulations of the United States Interstate Commerce Commission.

Emergency Relief Valve shall mean a manually operated valve for the discharge of refrigerant in case of fire or other emergency.

Evaporator shall mean that part of a system in which a refrigerant is expanded or vaporized to produce refrigeration.

Fusible Plug shall mean a device having a fusible metal that will melt at a predetermined temperature for the relief of pressure.

Generator shall mean a device equipped with a heating element used in a refrigerating system to increase the pressure of the refrigerant in its gas or vapor state for the purpose of liquefying the refrigerant.

Liquid Receiver shall mean a vessel permanently connected to the high pressure side of the system for storage of refrigerant.

Mixer shall mean a vessel or device for mixing the refrigerant with another substance.

Pressure Imposing Element shall mean every device or portion of the equipment used for the purpose of increasing the pressure upon the refrigerant

Pressure Limiting Device shall mean a pressure or temperature-responsive mechanism for automatically stopping the operation of the pressure imposing element at a predetermined pressure.

Pressure Relief Device shall mean a pressure relief valve, a rupture member, a fusible plug or other approved device for relieving pressure.

Pressure Relief Valve shall mean a valve held closed by a spring or other means which automatically relieves the pressure in excess of its setting.

Pressure Vessel shall mean any refrigerant-containing receptacle of a refrigerating system other than expansion coils, headers and pipe connections.

Refrigerant shall mean a substance used to produce refrigeration by absorbing heat in its expansion or vaporization.

Refrigerant, Flammable, shall mean any refrigerant which will burn when mixed with air, such as ethyl chloride, methyl chloride and the hydrocarbons.

Refrigerant, Hydrocarbon, shall mean a refrigerant containing only hydrogen and carbon, as ethane, propane, isobutane and butane.

Refrigerant, Irritant, shall mean any refrigerant which has an irritating effect on the eyes, nose, throat, lungs or skin, such as ammonia and sulphur dioxide.

Refrigerating Systems shall mean a combination of parts in which a refrigerant is circulated for the purpose of extracting heat. Such systems are divided into the following types:

Direct System—A system in which the evaporator is located in the material or space refrigerated or in air circulating passages communicating with such space.

Indirect System—A system in which a liquid, as brine or water, cooled by the refrigerant, is circulated to the material or space refrigerated or is used to cool air so circulated.

Multiple System—A system employing the direct method of refrigeration in which the refrigerant is delivered to two or more evaporators in separately refrigerated spaces.

Unit System—A system which can be removed from the user's premises without disconnecting any refrigerant-containing parts.

Rupture Member shall mean a device which will automatically rupture at a predetermined pressure.

Sealed Unit shall mean a pressure imposing element which operates without stuffing boxes or which does not depend upon contact between moving and stationary surfaces for refrigerant retention.

Service Valves shall mean a key-operated shut-off valve in Class "C", "D" and "E" systems intended for use only during shipment, installation or repair.

Shell Type Apparatus shall mean a refrigerant-containing pressure vessel having tubes for the passage of a heating, cooling or refrigerating fluid.

Stop Valve shall mean a shut-off valve other than a service valve for controlling the flow of refrigerant.

Applications and Permits for Refrigerating Systems

Par. 9602. Applications for refrigerating systems shall be filed as required in Section 136 and permits secured before starting an installation, except that no applications or permits are required for unit refrigerating systems containing 20 pounds of refrigerant or less, or for air conditioning systems containing 10 pounds of refrigerant or less, and except for systems described in Paragraph 9604.

Required Drawings and Specifications for Refrigerating Systems

Par. 9603. Drawings and specifications shall be submitted with the applications for Class A or B refrigerating systems. Such drawings shall show the arrangement of the system, note the type and capacity of all equipment, show all connections and size of the piping and the details of compressor bases and of the supports for evaporative condensors. Detail drawings of compressors and of all pressure vessels, including evaporative condensors, shall be submitted if required by the Buildings Engineer.

No drawings or specifications are required with the applications for other systems.

Refrigerating Systems Requiring No Permit

Par. 9604. No refrigerating permits are required for a mechanical refrigerating system employing air or water as a refrigerant when installed under a heating and ventilating permit.

For other systems refer to Paragraph 9602.

Heat Generating Equipment in Refrigerating Systems

Par. 9605. All heat generating equipment, appliances and piping shall conform in every respect to the requirements for heat generating apparatus in Chapter 94, as related to the particular fuel used.

Materials, Appliances and Accessories for Refrigerating Systems

Par. 9606. Pressure tanks and similar accessories for refrigerating systems shall be designed and constructed in accordance with Section 935, and all other materials, accessories, appliances or equipment which are not of accepted standard design shall meet with the approval of the Buildings Engineer.

Electrical Requirements for Refrigerating Systems

Par. 9607. All electrical wiring and electrical equipment and appliances of refrigerating systems shall conform in every respect to the electrical requirements in Part VIII.

Plumbing Requirements for Refrigerating Systems

Par. 9608. All plumbing materials, work or operations used, done or performed in connection with any refrigerating system shall conform in every respect to the requirements of the Health Department.

Existing Refrigerating Systems

Par. 9609. Existing refrigerating systems which do not conform to the provisions of Chapter 96 of this Code shall be made to conform thereto when they are renewed or reconstructed or at any time when such refrigerating systems create or tend to create an imminent hazard to life or property.

SECTION 961

REFRIGERANTS

Scope of Refrigerants

Par. 9610. For the purpose of this Code, refrigerants shall include every substance enumerated in Paragraph 9611 or such others as may be approved by the Buildings Engineer for use as a refrigerant.

Classification of Refrigerants

Par. 9611. For the purpose of this Code, refrigerants are classified as follows:

Group I

Harmless

Water
Water Vapor

Group II

Non-Irritant and Non-Flammable

Dichloro-difluoro-methane CCl_2F_2 (F-12) (Freon)
Mono-fluro-trichloro-methane $CFCl_3$ (F-11) (Carrene No. 2)
Dichloro-tetrafluoro-ethane $C_2Cl_2F_4$ (F-114)
Dichloro-methane (Carrene No. 1) CH_2Cl_2
Carbon Dioxide CO_2

Group III

Irritant

Sulphur Dioxide SO_2
Ammonia NH_3

Group IV

Flammable

Methyl Chloride CH_3Cl
Dichloro-ethylene $C_2H_2Cl_2$
Ethyl Bromide C_2H_5Br
Methyl Bromide CH_3Br

Group V

Explosive

Ethane C_2H_6
Propane C_3H_8
Butane C_4H_{10}
Isobutane C_4H_{10}
Ethyl Chloride C_2H_5Cl
Methyl Formate $C_2H_4O_2$

Properties of Refrigerants

Par. 9612. The properties of certain refrigerants together with their high and low test pressures are given in the following table:

TABLE 9612T

Group	Refrigerant	Symbol	Characteristics			Test Pressures in lbs. per sq. in.		Cu. ft. per lb. of gas or vapor at 68° F.	Safety Limit in Air	
			Irritant	Flammable	Explosive	High	Low		Per cent of Vol.	Lbs. per 1000 cu. ft.
II	Carbon Dioxide	CO_2	No	No	No	1500	750	8.75	28.0	33.0
	F 12	CCl_2F_2	No	No	No	235	150	3.18	28.0	85.0
	F 114	$C_2Cl_2F_4$				75	35	2.25	19.0	88.0
	Carrene #1	CH_2Cl_2	No	No	No	15	15	4.53	4.5	11.0
	F 11 " #2	$CFCl_3$						2.80	9.8	34.0
III	Sulfur Dioxide	SO_2	Yes	No	No	135	100	6.01	0.6	1.1
	Ammonia	NH_3	Yes	Yes	Yes	300	125	22.6	0.4	0.2
IV	Methyl Chloride	CH_3Cl	No	Yes	Yes	175	125	7.62	1.8	2.4
	Dicloro-ethylene	$C_2H_2Cl_2$	No	Yes	Yes	15	15	3.97	1.8	4.8
	Ethyl Bromide	C_2H_5Br						3.53	1.8	5.4
	Methyl Bromide	CH_3Br						4.05	0.5	1.2
V	Ethane	C_2H_6	No	Yes	Yes	1100	550			3.0
	Propane	C_3H_8	No	Yes	Yes	250	125			3.0
	Butane	C_4H_{10}	No	Yes	Yes	100	50			3.0
	Isobutane	C_4H_{10}	No	Yes	Yes	135	100			3.0
	Ethyl Chloride	C_2H_5Cl	No	Yes	Yes	100	50	5.96	3.8	6.0
	Methyl Formate	$C_2H_4O_2$	No	Yes	Yes	30	15	6.41	1.8	3.0

For other refrigerants, or where not specified in Table 9612T, the minimum test pressure for the high pressure side shall be not less than the vapor pressure of the refrigerant at 150 degrees Fahrenheit and the test pressure on the low side shall be not less than one-half of the vapor pressure at 150 degrees Fahrenheit.

Other substances not specifically named in the table shall not be permitted for use as a refrigerant unless approved by the Buildings Engineer after the United States Bureau of Standards or the Underwriters Laboratories have tested and approved the proposed substance for a refrigerant.

The Buildings Engineer shall determine the group of refrigerants to which the proposed refrigerant shall be added and the limit of its use.

SECTION 962

CLASSIFICATION OF REFRIGERATING SYSTEMS AND MACHINERY ROOMS

Scope of Refrigerating Systems

Par. 9620. Refrigerating systems shall include all installations or devices which are defined in Paragraph 9601.

Classification of Systems by Weight of Refrigerants

Par. 9621. Refrigerating systems shall be classified into the following five classes according to the total weight of refrigerants contained in or required for their proper operation:

Class	*Refrigerant Content*
A	1000 pounds and over
B	200 to 1000 pounds
C	35 to 200 pounds
D	10 to 35 pounds
E	Up to 10 pounds

Type X Refrigerating Machinery Rooms

Par. 9622. Type X refrigerating machinery rooms, used where required in this Chapter, shall conform to the following requirements:

Such rooms shall not be used for human occupancy, except by the operators of the machinery.

The doors shall be close-fitting and self-closing.

The walls shall be reasonably vapor tight.

Exterior openings shall not be under a fire escape or open stairway.

Emergency remote controls for the compressor or exhaust fan, if required or installed, shall be located immediately outside the machinery room or adjacent to an entrance door thereto on the inside of the machinery room.

Ventilation to the outer air shall be provided by means of windows, vents or mechanical ventilating systems of a capacity specified in Paragraph 9624.

Such rooms shall contain no apparatus with open flames if they house other than carbon dioxide refrigerants. Flames produced by matches, cigarette lighters, small alcohol lamps, and similar devices, shall not be considered open flames.

The supporting structural members from the foundation of the building to the floor slab of the machinery room shall be of not less than four-hour fire-resistive construction.

Type XX Refrigerating Machinery Rooms

Par. 9623. Type XX refrigerating machinery rooms, used where required in this Chapter, shall conform to the following requirements:

Such rooms shall not be used for human occupancy, except by the operators of the machinery.

The room shall be enclosed by not less than four-hour fire-resistive construction, with all openings protected by self-closing Class A fire doors. The supporting structural members from the foundation of the building to the floor slab of the machinery room shall be of not less than four-hour fire-resistive construction.

There shall be no openings into any other part of the building.

The exits from such rooms shall lead only to the outer air independent of and a safe distance from any and all other exits.

A system of sprinklers shall be installed having one sprinkler head to each 100 square feet of floor area. The system shall be of the dry type with open head sprinklers. The control shall be manual from a point outside of the machinery room, adjacent to an entrance thereto.

Emergency remote controls for the compressor or exhaust fan, where required or installed, shall be located immediately outside the machinery room or adjacent to each entrance door thereto on the inside of the machinery room.

Ventilation to the outer air shall be provided by a mechanical ventilating system of a capacity specified in Paragraph 9624.

Such rooms shall contain no apparatus with open flames, if they house other than carbon dioxide refrigerants. Flames produced by matches, cigarette lighters, small alcohol lamps, and similar devices shall not be considered open flames.

Ventilation for Refrigerating Machinery Rooms

Par. 9624. The window or vent areas or the capacities and duct areas of mechanical ventilating systems required for refrigerating machinery rooms shall be not less than those shown in the following table, except that in rooms containing only Group II refrigerants, such areas and capacities may be reduced by one-half:

TABLE 9624T

Maximum Refrigerant Content in Pounds	Mechanical Ventilating Systems		Total Open Area of Windows or Vents in Square Feet	
	Capable of Removing Air. Cubic Feet per Minute	Area of Ducts in Square Feet when used	For each side, when so placed in opposite walls as to provide a through air circulation	When placed in one wall only
20	150	¼	1	6
50	250	⅓	1½	12
100	400	½	2	16
150	550	⅔	2½	19
200	680	⅔	3	25
250	800	1	3½	29
300	900	1	4	32
400	1,100	1¼	4½	38
500	1,275	1¼	5	42
600	1,450	1½	6	45
700	1,630	1½	6½	48
800	1,800	2	7	51
900	1,950	2	7½	55
1,000	2,050	2	8	59
1,250	2,350	2¼	9	68
1,500	2,800	2½	11	78
1,750	3,150	3	12½	87
2,000	3,500	3½	14	95
2,500	4,150	4	16	113
3,000	4,500	4½	18	130
4,000	6,000	6	24	167
5,000	7,500	7½	30	204
6,000	9,000	9	36	241
7,000	10,000	10½	42	278
8,000	12,000	12	48	315
9,000	13,000	13	52	342
10,000	14,000	14	56	360
12,000	17,000	17	68	425
14,000	19,000	19	75	470
16,000	22,000	22	86	540
18,000	24,000	24	92	580
20,000	26,500	26	100	630
25,000	33,000	33	121	760
30,000	39,000	39	142	870
35,000	44,000	44	155	940
40,000	51,000	51	176	1,060
45,000	56,000	56	190	1,120

The exhaust to the outside air from a mechanical ventilating system in a Type XX machinery room shall be located at least 30 feet from any door, window, ventilating or similar opening and at least 30 feet above the ground level. Where approved means are provided to dilute the escaping refrigerant with air below the safety limits specified in Table 9612T, the Buildings Engineer may approve another location of such exhaust, provided that it is at least 30 feet above the ground level. All ventilating systems installed in refrigerating machinery rooms shall conform in all other respects to the applicable requirements in Chapter 95.

SECTION 963

USE OF GROUPS I AND II REFRIGERANTS

General Requirements for the Use of Groups I and II Refrigerants

Par. 9630. The use of Group I refrigerants is permitted without restrictions for all occupancies. Group II refrigerants are permitted only within the limits and occupancies noted in this Section, but the quantities in rooms other than Type X or Type XX machinery rooms shall not exceed the safety limits in air given in Paragraph 9612.

Group II Refrigerants in Public or Private Assembly Buildings

Par. 9631. Unit systems with Group II refrigerants are permitted without restrictions in Public or Private Assembly buildings.

Direct systems in Public or Private Assembly buildings shall contain not more than 100 pounds of Group II refrigerants and shall be entirely confined to such kitchens or other rooms accessible to employees only which are equipped with close-fitting self-closing doors and have positive ventilation, except that Class E or Class D direct systems may be located anywhere.

In indirect systems with Group II refrigerants, in Public or Private Assembly buildings, the refrigerant containing parts shall be located in Type X machinery rooms, except that in systems containing not more than 100 pounds of refrigerants the refrigerant containing parts may be located in rooms required for direct systems. Where such machinery rooms are placed above the first story, the quantity of the refrigerant shall not exceed 300 pounds.

For restrictions in air conditioning systems with Group II refrigerants, see Paragraph 9637.

Group II Refrigerants in Dwellings

Par. 9632. All unit systems with Group II refrigerants shall be of Class D or Class E in Dwellings.

In all other systems containing more than 300 pounds of Group II refrigerants, in Dwellings, the pressure imposing equipment shall be located either in a Type X machinery room or outside the building served by such system.

Direct systems with Group II refrigerants in Dwellings shall be entirely confined to such kitchens serving public dining rooms or such other rooms accessible to employees only which are equipped with close-fitting, self-closing doors and have positive ventilation. Such systems shall contain not more than 1000 pounds of refrigerant.

In indirect systems with more than 1000 pounds of Group II refrigerants in Dwellings, all refrigerant containing parts shall be located in a Type X machinery room.

For restrictions of air conditioning systems with Group II refrigerants, see Paragraph 9637.

Group II Refrigerants in Institutions

Par. 9633. Direct systems with Group II refrigerants are prohibited in Institutions with the following exceptions:

> In bedrooms, wards, infirmaries, cell blocks, or other places where persons are confined in bed or otherwise detained, unit systems using such quantity of refrigerants are permitted, which, if discharged in the room, their proportion in the air will not exceed one-half of the safe limits as fixed in the table in Paragraph 9612, but the total quantity of the refrigerant shall never exceed 20 pounds. Elsewhere Class E or Class D unit systems are permitted in Institutions.
>
> In Institutions, direct systems containing less than 100 pounds of refrigerants, wholly confined to a kitchen, laboratory, or other room accessible to employees only, are permitted if such rooms are equipped with close-fitting, self-closing doors and positive ventilation.

In indirect systems using a Group II refrigerant, in Institutions, all refrigerant-containing equipment shall be located in a Type X machinery room placed in the basement, in the first story, or outside of the building served by such system, except that in systems containing less than 2000 pounds of refrigerant, such machinery rooms may be placed on a roof or in a penthouse.

For restrictions of air conditioning systems with Group II refrigerants, see Paragraph 9637.

Group II Refrigerants in Office Buildings

Par. 9634. There are no restrictions to the use of Group II refrigerants in any system, except air conditioning, in Office buildings.

For restrictions of air conditioning systems with Group II refrigerants, see Paragraph 9637.

Group II Refrigerants in Commercial Buildings

Par. 9635. In Commercial buildings, the pressure-imposing apparatus of all systems containing more than 300 pounds of Group II refrigerants shall be located in a Type X machinery room.

Direct systems in Commercial buildings shall contain not more than 1000 pounds of Group II refrigerants.

In indirect systems with more than 1000 pounds of Group II refrigerants in such buildings, all refrigerant-containing parts shall be located in a Type X machinery room.

For restrictions of air conditioning systems, see Paragraph 9637.

Group II Refrigerants in Industrial or Storage Buildings

Par. 9636. There are no restrictions for the use of Group II refrigerants in any system, except air conditioning, in Industrial or Storage buildings.

For restrictions of air conditioning systems with Group II refrigerants, see Paragraph 9637.

Group II Refrigerants in Air Conditioning Systems

Par. 9637. The quantity of Group II refrigerants in direct air conditioning systems shall not exceed one pound to each 100 cubic feet of the total space to be cooled.

In other respects, air conditioning systems with Group II refrigerants shall be in accordance with all applicable requirements of this Section.

SECTION 964

USE OF GROUP III REFRIGERANTS

General Requirements for Use of Group III Refrigerants

Par. 9640. The use of Group III refrigerants is permitted only within the limits and occupancies noted in this Section, but the quantities in rooms other than Type X or Type XX machinery rooms shall not exceed the safety limits in air given in Paragraph 9612.

Group III Refrigerants in Public or Private Assembly Buildings

Par. 9641. Unit and Direct systems, with Group III refrigerants, in Public or Private Assembly buildings, are not permitted, except Class D or Class E systems. Direct systems containing more than 20 pounds of Group III refrigerants in Public or Private Assembly buildings shall be entirely confined to such kitchens and other rooms accessible to employees only which are equipped with close-fitting self-closing doors and positive ventilation.

Indirect systems in such buildings shall contain not more than 1000 pounds of Group III refrigerants, and all refrigerant-containing parts shall be located in a Type XX machinery room placed in the first story or basement of such buildings.

For restrictions of air conditioning systems with Group III refrigerants, see Paragraph 9647.

Group III Refrigerants in Dwellings

Par. 9642. In Dwellings, the pressure-imposing apparatus of all systems containing 100 pounds or less of Group III refrigerants, except those of unit systems, shall be located in a Type X machinery room. In all systems containing more than 100 pounds of such refrigerants, in Dwellings, the refrigerant-containing parts shall be located in a Type XX machinery room placed in the first story or basement of such buildings.

Direct systems with Group III refrigerants shall in Dwellings also be subject to the following limitations:

a. Unit systems shall be of Class D or Class E.

b. When installed in any story above the first, which is accessible to the public, they shall not contain more than 50 pounds of refrigerants.

Indirect systems in Dwellings shall contain not more than 1000 pounds of Group III refrigerants.

For restrictions of air conditioning systems with Group III refrigerants, see Paragraph 9647.

Group III Refrigerants in Institutions

Par. 9643. All unit systems with Group III refrigerants shall be of Class E in institutions. No other direct systems with Group III refrigerants are permitted.

Indirect systems in such buildings shall contain not more than 1000 pounds of Group III refrigerants, and all refrigerant-containing equipment shall be located in a Type XX machinery room placed in the first story or basement of such buildings.

For restrictions of air conditioning systems with Group III refrigerants, see Paragraph 9647.

Group III Refrigerants in Office Buildings

Par. 9644. All unit systems with Group III refrigerants shall be of Class D or E in Office Buildings. No other direct systems with Group III refrigerants are permitted.

Indirect systems in Office Buildings shall contain not more than 1000 pounds of Group III refrigerants, and all refrigerant-containing parts shall be located in a Type XX machinery room placed in the first story or basement of such buildings.

For restrictions of air conditioning systems with Group III refrigerants, see Paragraph 9647.

Group III Refrigerants in Commercial Buildings

Par. 9645. In Commercial buildings, the pressure-imposing apparatus of all systems containing 100 pounds or less of Group III refrigerants, except those of unit systems, shall be located in a Type X machinery room. In all systems containing more than 100 pounds of such refrigerants, in Commercial buildings, the refrigerant-containing parts shall be located in a Type XX machinery room placed in the first story or basement of such buildings.

Direct systems with Group III refrigerants shall also be subject to the following limitations:

a. Unit systems shall be of Class D or Class E.

b. When installed in any story above the first which is accessible to the public, they shall contain not more than 50 pounds of refrigerants.

c. When installed in a Commercial building containing a dwelling unit, the system shall be located in the first story or basement of such building, and shall contain not more than 50 pounds of refrigerants.

Indirect systems in Commercial buildings shall contain not more than 1000 pounds of Group III refrigerants.

For restrictions of air conditioning systems with Group III refrigerants, see Paragraph 9647.

Group III Refrigerants in Industrial or Storage Buildings

Par. 9646. Class D or Class E unit systems with Group III refrigerants are permitted without restrictions in Industrial or Storage buildings.

Other unit or direct systems with Group III refrigerants shall not be installed in such buildings if the number of employees in the stories above the first is more than one for each 200 square feet of floor area.

Indirect systems with Group III refrigerants may be installed in such buildings without restrictions.

For restrictions of air conditioning systems with Group III refrigerants, see Paragraph 9647.

Group III Refrigerants in Air Conditioning Systems

Par. 9647. Direct air conditioning systems with Group III refrigerants shall not be installed in any building, except in such Industrial or Storage buildings where the number of employees does not exceed one to each 200 square feet of floor area in the rooms in which the air is circulated.

Unit coolers with Group III refrigerants shall not be installed in locations where the number of occupants is more than one to each 150 square feet of floor area in the space in which the air is circulated.

Indirect air conditioning systems with Group III refrigerants shall be subject to the limitations for other indirect refrigerating systems in the various buildings.

SECTION 965

USE OF GROUPS IV AND V REFRIGERANTS

General Requirements for Use of Groups IV and V Refrigerants

Par. 9650. The use of Groups IV and V refrigerants is permitted only within the limits and occupancies noted in this

Section, but the quantities in rooms other than Type X or XX machinery rooms shall not exceed the safety limits in air given in Paragraph 9612.

Odorless refrigerants when used in systems containing more than 6 pounds of refrigerant, shall have added a substance which will impart a pungent odor or a mildly irritating quality.

Groups IV and V Refrigerants in Public or Private Assembly Buildings

Par. 9651. All unit systems with Group IV or V refrigerants shall be of Class E in Public or Private Assembly buildings, except that such systems with methyl chloride may be of Class D.

Direct systems using Group IV or V refrigerants are prohibited in Public or Private Assembly buildings except Class D or Class E systems with methyl chloride. Direct systems containing more than 20 pounds of methyl chloride in Public or Private Assembly buildings shall be entirely confined to such kitchens or other rooms accessible to employees only which are provided with self-closing, tight-fitting doors and positive ventilation.

Indirect systems in Public or Private Assembly buildings shall contain not more than 500 pounds of Group IV refrigerants, and all refrigerant-containing parts shall be located in a Type XX machinery room placed in the first story or basement of any such building.

Indirect systems containing Group V refrigerants are prohibited in Public or Private Assembly buildings.

For restrictions of air conditioning systems with Group IV or V refrigerants, see Paragraph 9657.

Groups IV and V Refrigerants in Dwellings

Par. 9652. All unit systems with Group IV or V refrigerants shall be of Class E in Dwellings.

In other systems in Dwellings, Group IV or V refrigerants are prohibited except as follows:

a. Class E or Class D direct systems with methyl chloride are permitted.

b. Multiple systems with not more than 50 pounds of methyl chloride are permitted.

c. Indirect systems with not more than 500 pounds of methyl chloride and with all refrigerant containing parts located in a Type XX machinery room placed in the first story or basement of any such building are permitted.

For restrictions of air conditioning systems with Group IV or V refrigerants, see Paragraph 9657.

Groups IV and V Refrigerants in Institutions

Par. 9653. In Institutions, systems with Group IV or V refrigerants are prohibited, except as follows:

a. Class E unit systems with methyl chloride are permitted.

b. Indirect systems with not more than 500 pounds of methyl chloride, and with all refrigerant-containing parts located in a Type XX machinery room placed in the first story or basement of any such building are permitted.

For restrictions of air conditioning systems with Group IV or V refrigerants, see Paragraph 9657.

Groups IV and V Refrigerants in Office Buildings

Par. 9654. All unit systems with Group IV or V refrigerants shall be of Class D or Class E in Office buildings.

In other systems in Office buildings, Group IV or V refrigerants are prohibited, except as follows:

a. Class E or Class D direct systems with methyl chloride are permitted.

b. Multiple systems with not more than 50 pounds of methyl chloride are permitted.

c. Indirect systems with not more than 500 pounds of methyl chloride and with all refrigerant-containing parts located in a Type XX machinery room placed in the first story or basement of any such building are permitted.

For restrictions of air conditioning systems with Group IV or V refrigerants, see Paragraph 9657.

Groups IV and V Refrigerants in Commercial Buildings

Par. 9655. All unit systems with Group IV or V refrigerants shall be of Class D or Class E in Commercial buildings.

In all other systems in Commercial buildings Group V refrigerants are prohibited.

Direct systems, other than unit systems, with Group IV refrigerants in Commercial buildings shall be subject to the following limitations:

a. Where the system is located in stories or fire areas normally occupied by employees only, it shall contain not more than 200 pounds of refrigerants with the pressure-imposing apparatus located in a Type XX machinery room.

b. Where the system is located in stories or fire areas accessible to the public, it shall contain not more than 100 pounds of refrigerants, with the pressure-imposing apparatus located in a Type XX machinery room placed in the basement or first story of any such building.

Indirect systems in Commercial buildings shall contain not more than 500 pounds of Group IV refrigerants and all refrigerant-containing parts in such systems shall be located in a Type XX machinery room.

For restrictions of air conditioning systems with Group IV and V refrigerants, see Paragraph 9657.

Groups IV and V Refrigerants in Industrial or Storage Buildings

Par. 9656. Class A systems with Group IV or V refrigerants shall not be installed in Industrial or Storage buildings unless they are Type A, Fireproof, buildings.

Unit systems with Group IV or V refrigerants shall be of Class D or Class E.

Direct and unit systems with Group IV refrigerants shall not be installed in Industrial or Storage buildings where the number of employees in any story is more than one for each 150 square feet of floor area.

In Industrial or Storage buildings, the quantity of Group V refrigerants in other than unit systems shall not exceed 10 pounds, except that in Industrial buildings or parts thereof used for the liquefaction of gases, a larger amount may be used if approved by the Buildings Engineer.

In indirect systems with Group IV or V refrigerants installed in such buildings where the number of occupants exceeds one for each 150 square feet of floor area in any story thereof, the refrigerant-containing parts shall be located in a Type XX machinery room.

For restrictions of air conditioning systems with Group IV or V refrigerants, see Paragraph 9657.

Groups IV and V Refrigerants in Air Conditioning Systems

Par. 9657. Group V refrigerants are prohibited in all air conditioning systems.

Direct air conditioning systems with Group IV refrigerants shall not be installed in buildings where the number of occupants exceeds one to each 200 square feet of floor area in the space in which the air is circulated.

Unit coolers with Group IV refrigerants shall not be installed in locations where the number of occupants is more than one for each 150 square feet of floor area in the space where the air is circulated.

Indirect air conditioning systems with Group IV refrigerants shall be subject to the requirements for other indirect refrigerating systems in the various type buildings.

SECTION 966

DESIGN AND CONSTRUCTION OF REFRIGERATING SYSTEMS

General Requirements for Design of Refrigerating Systems

Par. 9660. Every part of a refrigerating system, except pressure gauges and control mechanism, shall be designed, constructed and assembled to withstand safely the refrigerant test pressure shown in the table of Paragraph 9612.

Pressure Vessels for Refrigerating Systems

Par. 9661. The material and construction of liquid receivers, shell condensers, shell coolers, shell evaporators, absorbers, and all other pressure vessels used in refrigerating systems shall safely withstand the action of the refrigerant used and the test pressure shown in table of Paragraph 9612.

Liquid receivers, except for carbon dioxide, shall be of sufficient capacity to contain the total charge of refrigerant, except where all evaporators are separately valved. Not more than eighty per cent of the net content of the shell and tube condenser may be considered as liquid receiver capacity.

Liquid-level gauges shall be as required in Paragraph 9679.

The design and construction of pressure tanks shall conform to the unfired pressure vessel regulations in Section 935.

Coils for Refrigerating Systems

Par. 9662. Refrigerant-containing parts of coils shall have a wall thickness sufficient to withstand the test pressure given in Paragraph 9612.

Coils shall be made of such materials or so treated externally as to avoid excessive corrosion from refrigerants, water, brine or atmospheric conditions.

Steel and Iron Pipe and Fittings for Refrigerating Systems

Par. 9663. The wrought iron or steel pipe in refrigerating systems shall be at least of extra heavy weight for sizes of one-and-one-half inches or less, and for all other sizes where the test pressure exceeds 250 pounds per square inch. All other steel or wrought iron pipe shall be at least of standard weight.

Pipe joints shall be screwed, flanged or welded. Screw joints shall conform to the American Standards Association pipe thread Standard B-2-1919. Exposed thread of galvanized pipe shall be tinned or otherwise coated to efficiently retard corrosion.

Flanges shall be screwed or welded to pipes. All flange fittings shall be of the recess gasket type. Flange bolts shall project through nuts.

Welds shall be made by the fluid or fusion process. All welding shall be in accordance with Section 636.

No cast metal fittings, except steel, semi-steel, malleable iron or bronze shall be used.

Reducing fittings or steel bushings shall be used where pipe is reduced one size only. For larger reductions, any approved fitting or bushing may be used.

No bends exceeding 10 degrees shall be made at the place of installation in standard butt welded pipe. All bends exceeding 10 degrees, which have a center radius of less than 6 pipe size diameters, shall be not less than of extra heavy pipe. Bends shall be substantially circular and free from wrinkles and kinks.

Seamless steel tubing shall conform to the thicknesses for standard and extra heavy pipe.

All piping shall be supported by hangers or other supports which are capable of carrying a load of 100 pounds if used for 2-inch or smaller pipe and of 200 pounds if used for other pipe.

Non-Ferrous Tubing, Pipe and Fittings for Refrigerating Systems

Par. 9664. The use of non-ferrous materials, except aluminum, in refrigerating systems with ammonia is prohibited.

All non-ferrous piping shall be supported by hangers or other supports which are capable of carrying a load of 100 pounds if used for 2-inch or smaller pipe and of 200 pounds if used for other pipe.

Seamless soft copper tubing used in refrigerating systems shall be as follows:

a. Tubing shall not exceed three-quarter inch in diameter nor shall their wall thickness be less than .034 inch.

b. Joints shall be flanged, soldered or flared.

c. Fittings shall be of forged brass, wrought copper or bronze.

d. No tubing joint shall be placed in a conduit.

Hard copper pipe shall be as follows:

a. It shall conform to the "Standard Specifications for Copper Water Tube", of the American Society for Testing Materials, Serial Designation B88-39, and it shall be of a thickness not less than that specified for "Class M" in aforesaid specifications.

b. Connections shall be made with sweated type fittings, and solder used shall be made of clean, unused metals having a melting point of not less than 400 degrees Fehrenheit and not more than 500 degrees Fehrenheit.

c. Fittings shall be of forged brass, wrought copper, or bronze.

Valves in Refrigerating Systems

Par. 9665. Stop or service valves shall be provided on refrigerating systems in accordance with the following table:

TABLE 9665T

Systems with Group II Refrigerants or Methyl Chloride						
Location	Class of System					
	A	B	C	D	E	
Compressor or Generator	x	x	x	x	x	See note
Condenser	x	x	. .	. .	. .	
Liquid Receiver	x	x	o	o	o	See note
Expansion Coil	x	x	. .	. .	. .	
Branch Headers	x	x	x	x	. .	
Flooded Evaporator	x	x	x	x	. .	
Systems with Group III, IV, or V Refrigerants, except Methyl Chloride						
Location	Class of System					
	A	B	C	D	E	
Compressor or Generator	x	x	x	x	x	See note
Condenser	x	x	. .	. .	. .	
Liquid Receiver	x	x	x	x	x	
Expansion Coil	x	x	I	I	I	
Branch Header	x	x	x	x	. .	
Flooded Evaporator	x	x	x	x	. .	

Legend:

x = valves on inlet and outlet connections.

I = valve on inlet connection.

o = valve on outlet connection.

Note: Hermetically closed Class E systems need not be equipped with such valves.

All stop valves shall be easily accessible.

Castings for Refrigerating Systems

Par. 9666. Castings used in the manufacture of compressors and other parts of refrigerating systems shall be of sufficient thickness and close grain structure to prevent the leakage of the refrigerant.

Identification and Tests of Apparatus for Refrigerating Systems

Par. 9667. Manufacturers supplying compressors, condensers, receivers, evaporators or other apparatus for refrigerating systems to others for assembly purposes, where such complete systems are not sold under the manufacturer's name or trade name, shall test such apparatus to at least the pressures specified herein, shall stamp or label thereon the name of the refrigerant for which they are built, and place an identification mark on them.

Pressure vessels, except compressors, shall bear a stamp or label indicating the test pressure.

Every system shall have the name of the refrigerant used affixed or printed in a permanent and complete manner thereto as follows:

1. In a Class A, B or C system, at a location depending on the individual requirements of the installation.
2. In a Class D or Class E system, on the machine name plate, cabinet or box.

Test Pressures for Refrigerating Systems

Par. 9668. Where the low pressure side of a Class A refrigerating system is protected by a safety valve, the test pressure shall be twice the pressure at which the safety valve is set.

For other requirements relating to test pressures, see Paragraph 9660.

SECTION 967

SAFETY CONTROLS AND DEVICES FOR REFRIGERATING SYSTEMS

Table of Safety Devices in Refrigerating Systems

Par. 9670. Refrigerating systems normally operating above atmospheric pressure shall be equipped with safety devices according to the following table:

TABLE 9670T

Refrigerant	Carbon Dioxide					Other Group II					Groups III, IV and V				
Class	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
1. Pressure Limiting Device..................	x	x	x	x		x	x	x	x		x	x	x	x	
2. Pressure Vessel Relief Device..................	x	x	x			x	x	x			x	x	x	x	
3. Compressor Relief Device	x	Z				x	Z				x	x	x		
4. Hand Operated Relief Valve..................	x					x	x				x	x			
5. Vent to Atmosphere from devices under Items 2 & 4.	x					x	x	Y			x	x	x		

Legend:

x = required.

Y = required on systems containing more than 100 pounds of refrigerants.

Z = required on a compressor operating at a guage pressure of more than 15 pounds per square inch, and having a displacement of more than 100 cubic feet per minute.

Every refrigerating system normally operated below atmospheric pressure shall be equipped with a pressure-relief device, pressure gauges, and shall be vented to the atmosphere, as shown in the above table.

Pressure Limiting Devices in Refrigerating Systems

Par. 9671. Pressure limiting devices in refrigerating systems shall be required to stop the action of the pressure-imposing element at a pressure less than 70 per cent of the pressure relief devices located on the high pressure side of the system.

Pressure Vessel Relief Devices in Refrigerating Systems

Par. 9672. Shell type apparatus such as condensers, liquid receivers, evaporators, liquid separators, and absorbers which can be cut off by stop valves shall be equipped with an approved pressure-relief device in such refrigerating systems as required by Paragraph 9670, set at a pressure not to exceed that for which the vessel is designed. Such devices shall be vented as required in Paragraph 9670, and the vents shall be installed as required in Paragraph 9684.

The minimum required rated discharge capacity of the relief device and its discharge pipe for a refrigerant containing vessel shall be determined by the following formula and table:

$C=fDL$

Where C=Minimum required rated discharge capacity of the relief device in pounds of air per minute.

D=Outside diameter of vessel in feet.

L=Length of vessel in feet.

f=Factor dependent upon the kind of refrigerant as follows:

Ammonia	NH_3	0.1
Dichlorodifluoromethane	Freon F-12	0.3
All other refrigerants		0.2

TABLE 9672T

Maximum Relief Pressure in lbs. per square inch gauge	Design Working Pressure, lbs. per square inch gauge	Pipe Length, in Feet	Standard Weight Pipe Nominal Size, Inches							
			Discharge Capacity in Pounds of Air per Minute							
			½	¾	1	1¼	1½	2	2½	3
100	53	50	2.6	5.2	9.6	19.0	28	52	81	140
100	53	75	2.2	4.2	7.8	16.0	23	43	66	114
100	53	100	1.8	3.6	6.8	13.0	20	37	57	99
100	53	150	1.6	3.0	5.4	11.0	16	30	47	81
100	53	200	1.4	2.6	4.8	9.6	14	26	41	70
100	53	300	1.0	2.2	4.0	7.8	11	21	33	57
125	66	50	3.2	6.4	12.0	24.0	35	65	101	175
125	66	75	2.6	5.2	9.8	19.0	28	53	82	143
125	66	100	2.2	4.6	8.4	17.0	25	46	72	124
125	66	150	1.8	3.8	7.0	14.0	20	38	58	101
125	66	200	1.6	3.2	6.0	12.0	17	33	51	87
125	66	300	1.4	2.6	4.8	9.8	14	27	42	72
150	79	50	3.8	7.8	14.0	28.0	42	78	122	210
150	79	75	3.2	6.4	12.0	23.0	34	64	99	171
150	79	100	2.8	5.4	10.0	20.0	30	55	86	148
150	79	150	2.2	4.4	8.2	16.0	24	45	70	121
150	79	200	2.0	3.8	7.0	14.0	21	39	61	105
150	79	300	1.6	3.2	5.8	12.0	17	32	50	86
175	92	50	4.6	9.0	17.0	33.0	49	91	142	244
175	92	75	3.8	7.4	14.0	27.0	40	75	116	200
175	92	100	3.2	6.4	12.0	23.0	34	64	100	173
175	92	150	2.6	5.2	9.6	19.0	28	53	82	141
175	92	200	2.2	4.6	8.4	17.0	24	46	71	122
175	92	300	1.8	3.6	6.8	14.0	20	37	58	100
200	105	50	5.2	10.0	19.0	38.0	56	104	162	280
200	105	75	4.2	8.4	16.0	31.0	45	85	132	228
200	105	100	3.6	7.2	14.0	27.0	39	74	115	198
200	105	150	3.0	6.0	11.0	22.0	32	60	94	162
200	105	200	2.6	5.2	9.6	19.0	28	52	81	140
200	105	300	2.2	4.2	7.8	16.0	23	43	66	114

TABLE 9672T—(Concluded)

Maximum Relief Pressure in lbs. per square inch gauge	Design Working Pressure, lbs. per square inch gauge	Pipe Length, in Feet	Standard Weight Pipe Nominal Size, Inches							
			Discharge Capacity in Pounds of Air per Minute							
			½	¾	1	1¼	1½	2	2½	3
250	131	50	6.4	13.0	24.0	47.0	70	130	206	350
250	131	75	5.4	11.0	20.0	39.0	57	106	166	286
250	131	100	4.6	9.2	17.0	34.0	49	92	144	248
250	131	150	3.8	7.4	14.0	27.0	40	75	117	202
250	131	200	3.2	6.4	12.0	24.0	35	65	102	175
250	131	300	2.6	5.2	9.8	19.0	28	53	83	143
300	158	50	7.8	15.0	29.0	57.0	83	156	244	420
300	158	75	6.4	13.0	23.0	46.0	68	128	199	342
300	158	100	5.4	11.0	20.0	40.0	59	111	172	296
300	158	150	4.6	9.0	17.0	33.0	48	90	140	242
300	158	200	4.0	7.8	14.0	28.0	42	78	122	210
300	158	300	3.2	6.4	12.0	23.0	34	64	100	171
400	210	50	10.0	21.0	38	76	111	208	324	560
400	210	75	8.4	17.0	31	62	91	170	264	457
400	210	100	7.4	15.0	27	54	79	148	230	396
400	210	150	6.0	12.0	22	44	64	120	187	324
400	210	200	5.2	10.0	19	38	56	104	163	280
400	210	300	4.2	8.4	16	31	45	85	133	228
500	263	50	13.0	26.0	48	94	139	260	406	700
500	263	75	11.0	21.0	39	77	114	213	330	570
500	263	100	9.2	18.0	34	67	98	184	287	495
500	263	150	7.4	15.0	28	55	80	150	234	405
500	263	200	6.4	13.0	24	47	70	130	203	350
500	263	300	5.2	10.0	19	39	57	106	166	286

Compressor Relief Devices in Refrigerating Systems

Par. 9673. Where compressor relief devices are required, in Paragraph 9670, in refrigerating systems, they shall be located between the pressure imposing element and the stop valve on the discharge side. Such valves shall be set at 90 per cent of the test pressure specified for the refrigerant used.

Where a Group III, IV or V refrigerant is used, such device shall be vented into the low pressure side of the system.

The inlet pipe size of these relief devices shall conform to the following table:

TABLE 9673T

Compressor Gross Displacement Cubic Feet per Minute	Size of Pipe
Up to 25	⅜ inch
25 to 100	½ "
100 to 200	¾ "
200 to 350	1 "
350 to 580	1¼ "
580 to 850	1½ "
850 to 1500	2 inches

The capacity of these relief devices shall be equal to or greater than the displacement of the compressor.

Hand Operated Relief Valves in Refrigerating Systems

Par. 9674. Where hand operated relief valves are required in Paragraph 9670 for refrigerating systems, their cross-sectional area shall be at least equal to that of the largest relief device required for the apparatus, and shall be so arranged or located that they may be operated outside the machinery room or adjacent to the entrance door on the inside of the machinery room.

Such valves shall be provided with a vent to the atmosphere when required in Paragraph 9670. The vents shall be installed as required in Paragraph 9684. The valves shall be connected to the low pressure side of the system in all cases.

The size of such valves shall be not less than 2 inches for Class B systems, and not less than 3 inches for Class A systems.

Valves shall be identified with a permanent tag containing definite instructions for operating.

Prohibited Location of Stop Valves in Refrigerating Systems

Par. 9675. No stop valve shall be located between a pressure-relief device or pressure limiting device and the part of a refrigerating system protected thereby, unless two such devices of required size are used, and so arranged that only one can be shut off at any one time.

King Valves in Refrigerating Systems

Par. 9677. All king valves in refrigerating systems shall be conspicuously marked with a card or metal plate.

Connections to Water Supply in Refrigerating Systems

Par. 9678. No refrigerating system shall be connected with the water supply system of the City of Baltimore in such a manner as to impair the purity thereof. Water used for removing heat from a refrigerating system shall not thereafter be used for drinking purposes. When a regulating valve is used, it shall be connected between the compressor or the condenser and the water supply system of the City of Baltimore.

Pressure and Level Gauges in Refrigerating Systems

Par. 9679. Class A and Class B refrigerating systems shall be equipped with pressure gauges on the high and low pressure sides.

Every liquid level gauge glass shall be of sufficient strength to withstand the high side test pressure and, except those of the bull's-eye-type, shall have automatic closing shut-off valves and shall be adequately protected against injury by slotted metal casings.

SECTION 968

INSTALLATION OF REFRIGERATING SYSTEMS

General Requirements for Installation of Refrigerating Systems

Par. 9680. Installation of all refrigerating systems, except Class E systems and self-contained package installations, shall be made by qualified mechanics, following issuance of permits for the work, and such installations shall be subject to the approval of the Buildings Engineer.

Installation of Piping in Refrigerating Systems

Par. 9681. The piping in refrigerating systems shall be supported to prevent excessive vibration and strain at connections.

Tests of Refrigerating Systems

Par. 9682. It shall be the duty of the installer of a Class A, B or C refrigerating system to apply tests to said system as required by this Code.

Such tests shall be made under the direction of the Buildings Engineer, and shall be applied to the refrigerating system, or parts thereof, before being put into use.

The testing of every refrigerating system shall include a pressure of vacuum test of the complete piping system, preferably with the evaporator installed, but valves thereon may be closed to prevent withdrawal of the refrigerant.

Under these tests, a partial vacuum of 20 inches of mercury shall be produced within the system.

All such test pressures and vacuums shall be held by every refrigerating system under test for a period of at least one hour with no indicated drop.

Gases Used for Testing Refrigerating Systems

Par. 9683. Pressure tests shall be made with air, carbon dioxide, nitrogen, or other inert gas approved by the Buildings Engineer. When practical, water may be used. When testing with air, care shall be taken to prevent the temperature at any point rising above 130 degrees Fehrenheit.

Relief Device Vents and Discharge of Refrigerants

Par. 9684. Where the discharge of a refrigerant or a vent from a pressure relief device to the outside atmosphere is required, the discharge pipe outlet shall be not less than 12 feet above the ground level and not closer than 10 feet to any exterior opening in any building, or closer than 20 feet to any fire escape or open stairway, and shall be equipped with a diffuser. The size of the discharge pipe shall be at least equal to that of the largest relief device outlet.

Ammonia may be discharged into a tank or mixer described in this paragraph instead of to the outside atmosphere.

The water in an ammonia discharge tank shall not be used for any purpose except ammonia absorption. At least one gallon of fresh water shall be provided in such tanks for every pound of ammonia in the system. The water shall be prevented from freezing without the use of salt or chemicals. Tanks shall be substantially constructed of not less than one-eighth inch steel and as required in Chapter 97. No horizontal dimension shall be greater than one-half the height. The tank shall have a hinged cover, or if closed, shall have a vent of ample capacity at the top of the tank only. The discharge pipe for the pressure relief valve shall be equipped with a diffuser and shall discharge the ammonia near the bottom of the tank. All pipe connections shall be through the top of the tank.

An ammonia mixer shall consist of a closed cylinder designed for 50 pounds per square inch working pressure, with ammonia and water inlet connections and a valveless connection to a reservoir for the storage of ammonia and water or to a storm-water sewer so arranged that the ammonia will be completely absorbed before leaving the mixer. The connection shall be so arranged that it is impossible to operate the hand-operated ammonia relief valve without first opening the valve supplying the water to the ammonia mixer, and so that no cross-connection may exist between the water and ammonia piping.

Where relief devices located on the pressure vessels are vented to the low pressure side of a system, the low pressure side shall be equipped with a relief device vented to the atmosphere.

SECTION 969

MAINTENANCE AND OPERATION OF REFRIGERATING SYSTEMS

Posting of Instructions for Refrigerating Systems

Par. 9690. The installer of Class A, B or C refrigerating systems shall prepare and post adjacent to the pressure-imposing element of such systems a card giving instructions and procedure in case of a breakdown or leak. The instructions shall be in legible type and the card conspicuously located.

Information on Refrigerating Systems

Par. 9692. Each Class A, B or C refrigerating system shall have attached in a permanent manner and in a conspicuous place within or immediately outside of the refrigerated space a metal tag or other emblem listing the type of refrigerant.

Test for Loss of Refrigerant

Par. 9695. Whenever the losses of refrigerants from a refrigerating system are such as to endanger the health or lives of the human occupants of any room or structure in which such refrigerating system, or any part thereof, is located, the owner of such system shall apply suitable pressure or other tests to the limits in Paragraph 9612 to prove the system tight.

Recharging Refrigerant

Par. 9696. Every refrigerant system which may be charged after installation shall have a charging connection. No container shall be left connected to any such system except while charging or withdrawing refrigerant.

Withdrawing Refrigerants

Par. 9697. Refrigerants withdrawn from any refrigerating systems for re-use shall be transferred to containers which are in accordance with the regulations of the Interstate Commerce Commission for the handling and storing of refrigerants.

The amount of refrigerant placed in any container shall not exceed the rated capacity of such container.

Owners' Responsibility for Refrigerating Systems

Par. 9698. The owner of the premises wherein any Class A refrigerating system with Group II refrigerants, or any Class A or Class B system with Group III, IV, or V refrigerants, is located, shall provide a capable and skilled operator at all times to properly maintain and operate any such refrigerating system.

Operation of Refrigerating Systems

Par. 9699. All refrigerating systems containing flammable or explosive refrigerants shall be operated in accordance with the requirements of, and subject to the approval of, the Fire Department.

All refrigerating systems containing irritant or toxic refrigerants shall be operated in accordance with the requirements of, and subject to the approval of, the Health Department.

CHAPTER 97

TANKS

Sec. 970—General Tank Regulations.
Sec. 971—Liquids and Gases.
Sec. 972—Location of Tanks.
Sec. 973—Tank Foundations and Supports.
Sec. 974—Design and Construction of Metal Tanks.
Sec. 975—Reinforced Concrete Tanks.
Sec. 976—Wood Tanks.
Sec. 977—Tank Piping and Equipment.
Sec. 978—Special Safety Regulations for Tanks.
Sec. 979—Existing Tanks.

SECTION 970

GENERAL TANK REGULATIONS

Scope of Tank Regulations

Par. 9700. The design, construction, location, protection, alteration, repair, maintenance and operation of every tank or group of tanks, reservoir or cistern and all piping, accessories or equipment attached thereto, used or intended to be used for the storage or handling of liquids and gases are included in the requirements of Chapter 97.

General Classification of Tanks

Par. 9701. Tanks shall be generally classified according to the material of which tanks are made as follows: (1) Metal tanks, (2) Wood tanks and (3) Concrete or masonry tanks.

Classification of Metal Tanks

Par. 9702. For the purpose of design and construction, metal tanks shall be divided into the following groups:

T1—Small Metal Tanks—shall include all horizontal or vertical tanks of standard size and shape, having a capacity of not over 10,000 gallons.

T2—Horizontal Metal Tanks—shall include all standard cylindrical tanks, which are erected in the field and so constructed that they may be set either vertically or horizontally, and having a capacity of from 5000 to 30,000 gallons.

T3—Vertical Metal Tanks—shall include all cylindrical tanks designed to set vertically only and having a capacity of over 10,000 gallons.

T4—Special Metal Tanks—shall include all horizontal tanks over 30,000 gallons capacity, all pressure tanks and all other tanks of special sizes and shapes.

Buried Tanks

Par. 9704. Buried tanks shall include every tank from which the contents cannot be siphoned or otherwise drawn off by gravity, and which are protected as required in this paragraph.

Every buried tank shall be placed a sufficient distance below the surface of the ground to safely support a concentrated live load of 5000 pounds directly over the center of the tank in addition to dead load, but there shall never be less than 3 feet of earth over a tank, except that in lieu of the required earth cover, a properly designed reinforced concrete slab not less than 6 inches in thickness may be used directly over a cover of well tamped earth not less than one foot in thickness, and such reinforced concrete slab shall extend not less than one foot beyond the outline of the tank in all directions.

Excavations for tanks buried below the surface of the floor of a building or below the surface of the ground shall not extend below the footings of any walls, piers or columns unless the nearest edge of the excavation is more than one and one-half times as far from the footing of any particular wall, pier or column as the bottom of the excavation is below the bottom of the footing of such wall, pier or column.

Where excavations for tanks are made in wet or loose earth, the banks shall be supported by sheeting, properly shored in a manner satisfactory to the Buildings Engineer, and if necessary tanks shall be supported as required in Paragraph 9737.

All underground iron or steel tanks shall be thoroughly coated on the outside with tar, asphaltum or other suitable rust-resisting material. Where any such tanks are placed in soil which contains corrosive substances, such tanks shall be protected against corrosive action as may be required by the Buildings Engineer.

Protected Tanks

Par. 9705. Protected tanks shall include every tank from which its contents can be drawn off by siphoning or by gravity, and which are protected as required for buried tanks or as required by this paragraph.

A tank buried less than 3 feet below the ground level shall be considered as protected if covered over with a level mound of earth, well tamped and not less than 3 feet in thickness from top of tank with a slope on all sides not steeper than one and one-half horizontal to one vertical and the beginning of slope at the top of the mound is not less than one foot beyond the outline of the tank.

In place of the required slopes, a reinforced concrete wall not less than 8 inches thick or masonry wall not less than 12 inches thick, designed as a retaining wall, may be substituted. There shall be not less than 12 inches between the wall and any part of the tank, and all space between wall and tank shall be filled with earth well tamped in place.

Tanks for Class III or IV liquids shall be considered protected if they are placed in a vault surrounded on all sides by masonry walls not less than 12 inches in thickness with a concrete floor not less than 4 inches in thickness and a concrete roof not less than 6 inches in thickness. Entrance to such vault shall be protected by a Class A fire door.

Exposed Tanks

Par. 9706. Tanks which are neither buried nor protected as required in this section shall be considered as exposed.

Gravity Discharge From Tanks

Par. 9707. Tanks containing Class I, II or III liquids shall not be provided with a gravity discharge, except in the following cases:

a. Where such tanks are surrounded by emergency reservoirs of a size and construction required in Paragraph 9783.

b. Where such tanks serve oil burners.

c. With the special permission of the Buildings Engineer, in refineries, manufacturing or jobbing plants, where the nature of the process requires gravity flow, or in plants and establishments handling Class II or III liquids of a nature which does not permit pumping.

Oil Refineries

Par. 9708. All parts of processing equipment, erected after the passage of this Code, for refining, distilling or condensing petroleum or natural gas, and all additions to such existing processing equipment shall be at least 100 feet from any adjoining property line or opposite street line.

Maintenance and Operation of Tanks

Par. 9709. Every tank and pipe line above the ground shall be kept painted and in good repair, and shall be provided with all fire extinguishing appliances, warning signs, and all other safety appliances for the safe operation of the tank or plant in accordance with the requirements of this Code and the Fire Prevention Code of Baltimore City.

SECTION 971

LIQUIDS AND GASES

Scope of Liquids and Gases

Par. 9710. Liquids and gases shall include all liquids or gases which are handled, stored, or transported in tanks and pipe lines.

Classification of Liquids

Par. 9711. For the purpose of this Code, liquids are divided into six classes as follows:

Class I—Includes all liquids or liquid mixtures with a flash point below 25 degrees Fahrenheit (minus 4 degrees Centigrade) closed cup tester.

Class II—Includes all liquids or liquid mixtures with a flash point above that for Class I and below 70 degrees Fahrenheit (21 degrees Centigrade) closed cup tester.

Class III—Includes all liquids or liquid mixtures with a flash point above that for Class II and below 200 degrees Fahrenheit (93½ degrees Centigrade) closed cup tester.

Class IV—Includes all liquids or liquid mixtures with a flash point at or above 200 degrees Fahrenheit (93½ degrees Centigrade and above) closed cup tester.

Class V—Includes all liquids and liquid mixtures which cannot be ignited, exploded or which are not corrosive.

Class VI—Includes all acids, other similar liquids or liquid mixtures which have a corroding effect upon materials of construction or otherwise hazardous to life or property.

Representative Examples of Liquids

Par. 9712. Representative examples of the various classes of liquids are shown in the following table:

TABLE 9712T

Class I	Class II	Class III	Class IV	Class V	Class VI
Ether Gasolene Naphtha Benzol Collodion Acetone	Alcohol Amyl Acetate Toluol Ethyl Acetate Methyl Acetate	Kerosene Amyl Alcohol Turpentine Fuel Oil	Transformer Oil Machine Oil Asphalt Coal Tar Animal Oil Molasses Lubricating Oil	Water Carbon Tetrachloride Vinegar Beer Wine	Sulphuric Acid Hydrochloric Acid Nitric Acid Ammonium Hydroxide

Fluid Commodities

Par. 9713. Any manufactured liquid or fluid commodity, such as paint, varnish, dryer, cleaning solution, polishing liquid and similar liquids which contain flammable liquids shall be considered a flammable liquid and shall be classified according to the flash point of the mixture.

Fluidity of Liquids

Par. 9714. The fluidity of liquids shall be measured in accordance with American Petroleum Institute units.

Determination of Flash Point

Par. 9716. The Tag, Abel-Pensky, Pensky-Martens, Elliott or Abel Closed Cup Tester shall be used in determining the flash point of all liquids to be used for fuel, but in case of dispute the flash point determined by the Tag Closed Cup Tester standardized by the United States Bureau of Standards shall be accepted as final.

Testing of Liquids

Par. 9717. All tests for all classes of liquids shall be made in accordance with the methods prescribed by the Specifications of the American Society for Testing Material.

Unclassified Liquids and Gases

Par. 9718. Unclassified flammable liquids and gases shall be classified in conformity with the requirements of this Code.

SECTION 972

LOCATION OF TANKS

General Requirements for Location of Tanks

Par. 9720. The distance between two tanks of different sizes or capacity or tanks of different classes of liquids shall be determined by the tank requiring the greatest distance.

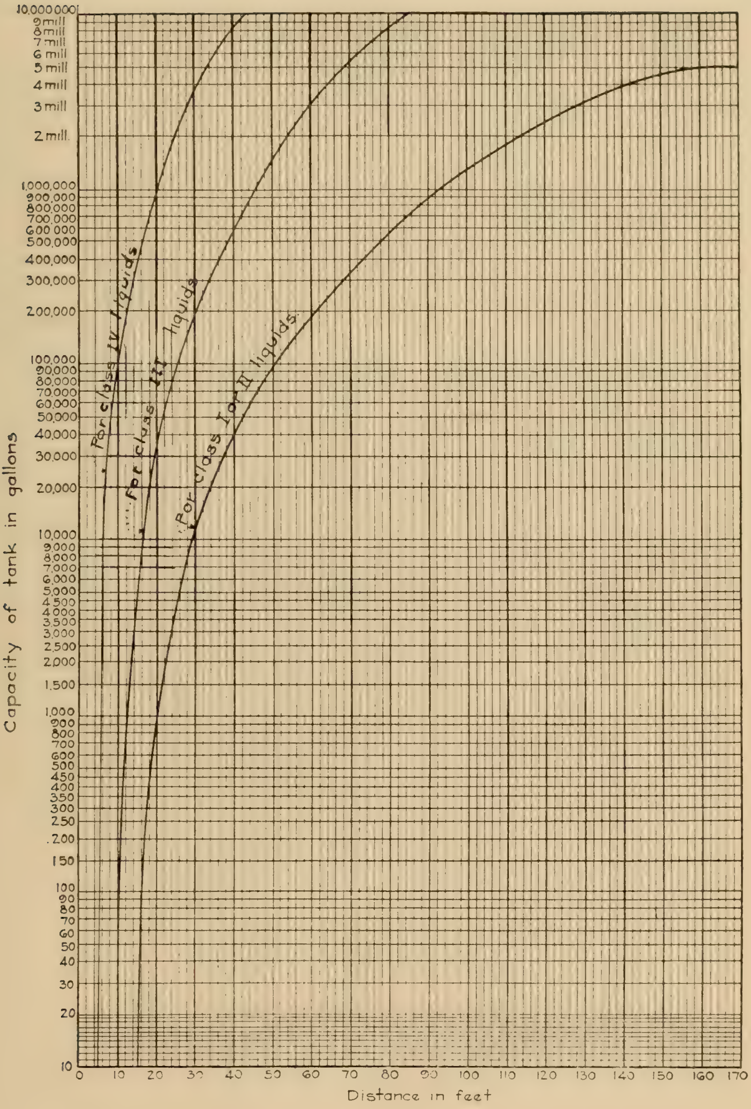
A cluster of tanks shall include all tanks enclosed in one emergency reservoir, and two or more tanks if the clear distances between them are less than those required in this Section. However, the clear distances between a cluster of tanks and any adjoining property line, opposite street line, structure or other tanks shall be not less than those required for individual tanks. In computing such distances, the cluster shall be considered one tank, whose volume is equal to the aggregate volume of the cluster, and whose diameter is equal to that of a cylinder having the same volume, and a height equal to its diameter. There shall be not more than 5,000,000 gallons of Class I, II, or III liquids in any one cluster of tanks.

The class of the most flammable liquid in any tank or any tank in a cluster of tanks shall be the class of liquid to be used for the aggregate capacity for all the tanks in determining the location of the cluster.

Location of Outside Exposed Tanks

Par. 9721. The clear distance between any outside exposed tank for Class I, II, III or IV liquids, and any adjoining property line, opposite street line, building or other structure which is not necessary for the operation of the tanks, shall be not less than that shown in the following diagram for various quantities:

DIAGRAM 9721D



The clear distance between any tank for Class V liquids and any adjoining property line, opposite street line, building or other structure shall be not less than 10 feet for any tank exceeding 500,000 gallons capacity, 5 feet for all tanks 500,000 gallons or less and more than 100,000 gallons, and 3 feet for all tanks 100,000 gallons or less in capacity.

The clear distance between any tank for Class VI liquids and any adjoining property line or opposite street line shall be not less than 20 feet for any tank exceeding 100,000 gallons capacity, 10 feet for all tanks 100,000 gallons or less and more than 50,000 gallons and 5 feet for all tanks 50,000 gallons or less in capacity.

Location of Outside Protected and Buried Tanks

Par. 9722. The clear distance in feet between any outside protected or buried tank from any adjoining property line, opposite street line, or building or other structure which is not necessary for their operation shall be not less than the distance given in the following table for the particular class of liquid and size of tank.

TABLE 9722T

Capacity of Tank in Gallons	Protected Tanks		Buried Tanks	Buried and Protected Tanks	
	Class I, II & III	Class IV	Class I, II, III & IV	Class V	Class VI
0 to 500	10	5	5	1	3
500 to 1,000	15	8	7	2	5
1,000 to 5,000	20	12	10	2	8
5,000 to 10,000	25	14	12	2	10
10,000 to 50,000	30	15	15	3	10
50,000 to 100,000	40	20	20	3	10
100,000 to 500,000	50	25	25	5	15
500,000 to 1,000,000	60	30	30	5	15
1,000,000 and over	80	40	40	10	20

Distance Between Outside Exposed Tanks

Par. 9724. The clear distance between outside exposed tanks for Class I, II or III liquids located on the same property shall not be less than:

3 feet for tanks up to 20,000 gallons.
5 feet for tanks 20,000 to 30,000 gallons.
10 feet for tanks 30,000 to 50,000 gallons.
13 feet for tanks 50,000 to 75,000 gallons.
15 feet for tanks 75,000 to 100,000 gallons.

For all tanks over 100,000 gallons, the clear distance shall be not less than the larger diameter or greatest horizontal dimension of such tanks.

The clear distance between such tank and a building or other structure on the same property, and accessory to the tank or tanks, shall be the same as that required above for two such tanks.

The clear distance between tanks for Class V liquids shall be not less than 5 feet for tanks exceeding 500,000 gallons capacity, and not less than 3 feet for 500,000 gallons and less.

The clear distance between tanks for Class IV or VI liquids shall be not less than 20 feet for tanks exceeding 500,000 gallons capacity, 10 feet for tanks 500,000 gallons or less, and more than 100,000 gallons, and 3 feet for tanks 100,000 gallons and less in capacity.

The regulations of this Paragraph do not apply to the individual tanks in a cluster.

Distance Between Outside Protected and Buried Tanks

Par. 9725. The clear distance between two protected or buried tanks or between a protected and a buried tank on the same property shall be not less than 2 feet for tanks 2000 gallons or less and 3 feet for tanks over 2000 gallons in capacity.

Location and Capacity of Tanks in Buildings

Par. 9727. The amount of liquids in gallons permitted to be stored in a building shall not exceed that given in the table below for each 5000 square feet of first floor area. Where the first floor area is less than 5000 square feet, or for fractions in excess of such area, a proportionate amount shall be taken.

TABLE 9727T

Class of Liquid	Condition of Tanks	Class of Occupancy							
		Public & Private Assembly, Dwelling, Institutional, Office		Commercial		Storage		Industrial*	
		Max. Size Tank	Max. Quant. of Liquid	Max. Size Tank	Max. Quant. of Liquid	Max. Size Tank	Max. Quant. of Liquid	Max. Size Tank	Max. Quant. of Liquid
I	Exposed	F. P.	F. P.	F. P.	F. P.	F. P.	F. P.	F. P.	F. P.
	Protected	..	..	50	100	50	500	50	200
	Buried	50	500	500	1000	1000	2000	1000	2000
II	Exposed	F. P.	F. P.	F. P.	F. P.	F. P.	F. P.	F. P.	F. P.
	Protected	..	..	50	500	50	1000	50	500
	Buried	50	100	500	1000	3000	9000	1000	2000
III	Exposed	300	600	300	600	300	1200	300	900
	Protected	500	1000	500	1000	500	5000	500	2000
	Buried	1000	5000	1000	3000	5000	10,000	5000	5000
IV	Exposed	300	600	300	600	300	9000	300	1200
	Protected	500	1000	500	2000	500	15,000	500	5000
	Buried	1000	5000	1000	6000	5000	50,000	5000	10,000
V	Exposed	No Limit	No Limit	No Limit	No Limit	No Limit	No Limit	No Limit	No Limit
	Protected	No Limit	No Limit	No Limit	No Limit	No Limit	No Limit	No Limit	No Limit
	Buried	No Limit	No Limit	No Limit	No Limit	No Limit	No Limit	No Limit	No Limit
VI	Exposed	5	20	50	300	50	5000	50	5000
	Protected	50	100	300	600	300	9000	300	9000
	Buried	300	900	500	2000	1000	10,000	1000	10,000

Legend: F. P.=as permitted in the Fire Prevention Code of Baltimore City.

* Except buildings used for the manufacturing and processing of petroleum products.

Class I or II liquids in exposed tanks containing more than 50 gallons in the aggregate shall be placed in rooms meeting the requirements of Paragraphs 4643, 4743 and 4843. No exposed or protected tank having a capacity exceeding 5000 gallons shall be placed closer than 3 feet to any wall or column, machine, or other tank, and no buried tank shall be placed less than 7 feet from any wall or column footing. Such tanks of 5000-gallon capacity or less shall not be less than one foot from any wall or column. In excavating for buried tanks the requirements of Paragraph 9704 shall not be violated.

Location of Gas Tanks and Gas Holders

Par. 9728. The distance of holders or tanks for combustible gases from adjoining property lines, opposite street lines, opposite sides of bodies of water not on the same property, and from Type E, F, or G buildings, except auxiliary buildings necessary for the operation of such holders or tanks, shall be not less than the following:

a. For holders or tanks of 10,000 cubic feet capacity or less, at least 10 feet.

b. For holders or tanks of more than 10,000 but not over 110,000 cubic feet capacity, at least 10 feet plus one foot for each 5000 cubic feet in excess of 10,000.

c. For holders or tanks of more than 110,000 cubic feet capacity located in the Third or Fourth Fire Zone, such distance shall be at least one foot for each 100,000 cubic feet of capacity, or any fraction thereof, with a minimum distance in any case of 30 feet. In other than the Third or Fourth Fire Zone the distances shall be established by an ordinance of the Mayor and City Council.

SECTION 973

TANK FOUNDATIONS AND SUPPORTS

General Requirements for Tank Foundations and Supports

Par. 9730. All tanks for every class of liquid shall be set on foundations designed and constructed in accordance with other parts of this Code which apply, as well as the requirements of this section.

Supports for Exposed Group T1 Tanks

Par. 9731. The base and supporting structure of all exposed Group T1 tanks shall be of incombustible material, except that supports for tanks for Class V and VI liquids may be of any material not affected by the liquids.

Supports for Exposed Group T2 Tanks

Par. 9732. All exposed Group T2 tanks shall be supported on masonry, reinforced concrete or steel encased in concrete, except that the supports of tanks for Class IV, V, or VI liquids need not be encased, but shall be of incombustible construction.

T2 tanks for Class I, II or III liquids supported on saddle piers more than 4 feet on centers shall have not less than 2 longitudinal beam supports under the tank.

Supports for Exposed Group T3 Tanks

Par. 9733. All exposed Group T3 tanks shall be supported on masonry, reinforced concrete or structural steel, protected to have a three-hour fire-resistive rating, except that storage tanks not more than three diameters in height may be supported directly upon the ground where the bearing capacity of the soil is sufficient to support safely the loads in accordance with Section 701.

Supports for Exposed Group T4 Tanks

Par. 9734. All exposed Group T4 tanks for Class I, II or III liquids shall be supported on masonry, reinforced concrete or steel, protected to have a three-hour fire-resistive rating, except that, when approved by the Buildings Engineer, such tanks with flat bottoms and whose height does not exceed the least dimension of the base may be supported directly on the ground and such tanks with special sizes and shapes may be supported on incombustible materials having a factor of safety not less than four.

The supports for tanks for Class IV, V or VI liquids shall be of incombustible materials. T4 tanks for Class I, II or III liquids supported on saddle piers shall conform to the requirements for such supports of T2 tanks in Paragraph 9732.

Supports for Concrete Tanks

Par. 9735. The supports for concrete tanks shall be masonry, reinforced concrete or steel encased in concrete.

Supports for Wood Tanks

Par. 9736. The supports for wood tanks shall be masonry, reinforced concrete, or steel construction except that wood supports may be permitted for tanks used only for Class V liquids when the bottom of the tank is less than 30 feet above the ground.

Supports for Buried and Protected Tanks

Par. 9737. Supports for buried and protected tanks shall be in accordance with Paragraph 9704, except that in very soft earth buried tanks shall be supported on a pile or other proper foundation designed to support the tank load, and where necessary to prevent floating, tanks shall be adequately anchored or weighted.

Tanks Supported on Buildings

Par. 9738. Supports for tanks on either new or existing buildings or other structures shall be thoroughly investigated and the maximum stresses produced by all loads in any member or part of the structure shall not exceed the maximum stresses allowed in Part VI of this Code.

For the supports of tanks on the roofs of buildings, refer to Part V.

SECTION 974

DESIGN AND CONSTRUCTION OF METAL TANKS

General Requirements for Metal Tanks

Par. 9740. The steel plates and other structural parts used in the construction of steel tanks for all classes of liquids shall conform to the "Standard Specifications for Steel for Bridges and Buildings" of the American Society for Testing Materials, Serial Designation A7-39.

The rivets for hot or cold driving shall conform to either of the following specifications of the American Society for Testing Materials: "Standard Specifications for Structural Rivet Steel", Serial Designation A141-38, or "Standard Specifications for Boiler Rivet Steel and Rivets", Serial Designation A31-36. Rivets for cold driving shall be annealed.

Tanks may be constructed of copper and other suitable metal when properly designed and constructed in accordance with the requirements of this Code, and such tanks may be used for any class of liquid or gas for which they are adaptable when the use of such tanks has been approved by the Buildings Engineer.

Construction of Group T1 Tanks

Par. 9741. Sheets and plates of ferrous metal used in the construction of Group T1 tanks shall be not less in thickness than that specified in the table below:

TABLE 9741T

Capacity in Gallons	Thickness of Metal		Weight per Square Foot
	Inches	U. S. Std. Gauge	
10 to 60.......	.0500	18	2.00
60 to 300.......	.0625	16	2.50
300 to 600.......	.0781	14	3.125
600 to 1,200.......	.1095	12	4.375
1,200 to 4,000.......	.1875	7	7.50
4,000 to 10,000.......	.2451	3	10.00

When sheets or plates of copper or other non-ferrous metal are used in the construction of Group T1 tanks, the minimum thickness of such sheets or plates shall be determined by multiplying the thicknesses given in the table above by the following ratio:

$$\frac{60{,}000}{\text{Ultimate tensile stress of metal}}$$

The seams in Group T1 tanks shall be riveted or welded in a manner that will develop at least 80 per cent of the full strength of the plate. All pipe connections shall be reinforced with a metal plate properly riveted, bolted, or welded to the tank, except connections of pipe one inch or less in size.

Tanks of ferrous metal thinner than No. 7 gauge (3/16 inch) shall be galvanized after riveting or welding, coated by a covering affording equal protection or otherwise protected against corrosion.

Construction of Group T2, Horizontal, Metal Tanks

Par. 9742. Steel plate used in the construction of all Group T2 tanks shall be not less in thickness than that specified in the table below:

TABLE 9742T

Capacity in Gallons	Minimum Thickness	Weight per Square Foot
5,000 to 10,000.......	¼ inch	10.20
10,000 to 20,000.......	5/16 inch	12.75
20,000 to 30,000.......	⅜ inch	15.30

Where such tanks are located entirely above the ground level, the thicknesses in Table 9742T may be reduced by 1/16 inch.

When any other metal than steel is used in the construction of Group T2 tanks, the minimum thickness of the metal plate shall be determined by multiplying the thickness for steel plate given in the table above by the following ratio:

$$\frac{60{,}000}{\text{Ultimate tensile stress of metal}}$$

Group T2 tanks shall be riveted or welded throughout. All riveting shall be sufficient to develop the strength of the plate as fixed by the designed efficiency of the joints and be done in accordance with Section 635. Welding shall be sufficient to develop at least 90 per cent of the strength of the plate and shall be done in accordance with the requirements of Section 636. All pipe connections to tanks constructed of metal plates less than five-sixteenths of an inch thick shall be made through flanges or metal reinforcements not less than three-eights of an inch thick, securely and tightly riveted, welded or bolted to the tank, except connections of pipe one inch or less in size.

Construction of T3, Vertical, Metal Tanks

Par. 9743. The working stresses for design of all Group T3 steel tanks for Class I, II, III or IV liquids shall not exceed the following:

Maximum tensile stress in plate—1 foot above
horizontal seams ....21,000 pounds per square inch
Maximum shear in rivets...16,000 pounds per square inch
Maximum bearing stresses:
Single shear ....32,000 pounds per square inch
Double shear ....40,000 pounds per square inch

Maximum stresses in tanks for all other classes of liquids shall not exceed the maximum stresses in Chapter 63 for steel structures in general.

Riveting shall be sufficient to develop the full strength of the plate as fixed by the efficiency of the joint.

Welding shall be in accordance with the requirements of Section 636 and sufficient to develop 90 per cent of the strength of the plate.

All openings in the shell of the tank over 2 inches in diameter shall be reinforced by an additional plate riveted or welded over the hole or by a flange bolted to plate or both.

Roofs of T3 tanks shall be designed for a live load of not less than 15 pounds per square foot in addition to dead load and the supporting structure shall be in accordance with the requirements of Part VI of this Code, except that the value l/r shall not exceed 150 for columns and primary compression members, or 210 for secondary compression members.

Construction of T4 Tanks

Par. 9744. Group T4 tanks shall be designed and constructed in accordance with the fundamental engineering principles of design and construction applying to other similar types of structures, as far as reasonable and consistent with the intent of this Code, and such tanks shall meet the approval of the Buildings Engineer. Pressure tanks shall be constructed in accordance with Section 935.

SECTION 975

REINFORCED CONCRETE TANKS

General Requirements for Reinforced Concrete Tanks

Par. 9750. The reinforced concrete in tanks shall conform to all the requirements for reinforced concrete in Part VI, except where otherwise specifically required in this Section.

Supports for Reinforced Concrete Tanks

Par. 9751. For the supports of reinforced concrete tanks, refer to Paragraph 9735.

Material for Reinforced Concrete Tanks

Par. 9752. The materials used in the construction of reinforced concrete tanks shall be as required in Chapter 64, and specially selected and proportioned so as to produce a dense concrete which concrete will not permit the passage of water under the head for which any such tank is designed.

Design and Construction of Reinforced Concrete Tanks

Par. 9753. The design of the shell, roof and bottom of reinforced concrete tanks shall be in accordance with the requirements of Paragraph 6594, Design of Reinforced Concrete Tanks. The walls of reinforced concrete tanks shall be constructed independently of and not in contact with any building wall.

Formwork for Reinforced Concrete Tanks

Par. 9754. Forms for reinforced concrete tanks shall conform to requirements of Section 665 of this Code.

Reinforcing of Concrete Tanks

Par. 9755. All concrete tanks shall be reinforced with not less than one per cent of metal reinforcement of a quality not below that required for other reinforced concrete.

Mixing and Placing of Concrete for Tanks

Par. 9756. When the placing of concrete for tanks has once been started, it shall not be stopped until all concrete in the tank has been poured, unless special precautions are exercised to procure leak-proof construction joints.

Curing of Reinforced Concrete Tanks

Par. 9757. Forms for reinforced concrete tanks shall not be removed until after the concrete has taken the final set.

Concrete shall be kept thoroughly wet for not less than 28 days.

Restrictions to Use of Concrete Tanks

Par. 9759. Reinforced concrete tanks shall not be permitted for storage or handling of Class I, II, III or IV liquids or any other liquid which will disintegrate the concrete.

SECTION 976

WOOD TANKS

General Requirements for Wood Tanks

Par. 9760. Wood tanks shall conform to all the requirements for wood structures except where otherwise specifically required in this Section.

Supports for Wood Tanks

Par. 9761. For supports for wood tanks, refer to Paragraph 9736.

Material for Wood Tanks

Par. 9762. Wood used in the construction of tanks shall be spruce, redwood, cedar, white pine, oak or other durable wood approved by the Buildings Engineer. A combination of wood and steel tanks shall be classed as wood tanks and permitted only where wood tanks are permitted.

Construction of Wood Tanks

Par. 9763. Wood tanks shall be designed and constructed to withstand all loads imposed without exceeding the maximum stresses permitted in Chapter 62.

Pipe Connections to Wood Tanks

Par. 9768. All pipe connections to wood tanks shall be made by special cast, malleable or wrought iron flanges bolted to the sides or bottom.

Restricted Use of Wood Tanks

Par. 9769. Wood tanks shall not be permitted for the storage or handling of Class I, II, III and IV liquids or any other liquid which will disintegrate or otherwise have a detrimental effect on the wood. No wood tank shall be buried in earth or enclosed with any other material which will absorb moisture, unless such tank is thoroughly protected by a waterproof covering or furring approved by the Buildings Engineer.

SECTION 977

TANK PIPING AND EQUIPMENT

General Requirements for Tank Piping and Equipment

Par. 9770. All pipes, fittings, transfer pumps, filling station pumps, vents, fill vents and fill equipment, pipe valves and all other pipe accessories used, or intended to be used, or relating to the venting, filling, or emptying of tanks, shall be in accordance with the requirements of this section. Piping shall be of a standard weight or type approved by the Buildings Engineer, and so located as to be protected against mechanical injury at all times. When located along driveways and other similar exposed locations, adequate protection shall be provided, such as metal guards or burying under ground.

Venting T1 Tanks

Par. 9771. Every exposed, protected and buried tank of Group T1 for Class I, II, III or IV liquids shall be equipped with a standard wrought iron or steel vent pipe not smaller than the next pipe size below that of the fill pipe, and no such vent pipe shall be less than one inch in diameter for tanks over 200 gallons capacity. All such vent pipes shall terminate outside of any building at a point not less than that given in the following table from any door, window or other similar opening, or from any woodwork or other combustible material or from any adjoining property line, except that vents from every T1 tank for Class I or Class II liquids shall terminate at a point located not less than 10 feet from any adjoining property line and not less than 10 feet above the ground.

TABLE 9771T

Required Size of Vent Pipe	Minimum Distance, in Feet, from Openings or Combustible Material			
	Horizontal		Vertical	
	Class I, II	Class III, IV	Class I, II	Class III, IV
1 inch Diam.....	3	1	5	2
1¼ “ “	3	1	6	3
1½ “ “	5	2	8	5
2 “ “	6	3	10	6
2½ “ “	7	4	12	8
3 “ “	9	5	15	10
4 “ “	12	6	20	13

Not more than 4 tanks shall be permitted to manifold into a single vent pipe 2 inches or more in diameter.

Flame arresters shall be provided on all vent pipes exceeding 2 inches in diameter.

Vent pipes shall drain back to the tank without traps or other obstructions.

Venting T2 Tanks

Par. 9772. Every Group T2 horizontal or vertical tank designed, used or intended to be used for Class I, II or III liquids, shall be provided with an approved vent, and such vent shall be equipped with an approved flame arrester and installed so as to drain back to the tank. The clear vent openings in Group T2 tanks shall be as required in Paragraph 9782, but no vent shall be less than 2-inch pipe size. Such vent shall terminate at a point, outside of any building, not less than 10 feet above the ground and at a distance from any door, window or other opening, or from any woodwork, other combustible material, or from any adjoining property line not less than that given in the following table:

TABLE 9772T

Size of Vent Pipe in Inches	Minimum Distance, in Feet, from any Opening, Combustible Material or Property Line			
	Horizontal		Vertical	
	Class I, II	Class III, IV	Class I, II	Class III, IV
1¼	3	1	6	3
1½	5	2	8	5
2	6	3	10	6
2½	8	4	15	8
3	10	5	20	10
4	13	7	25	13
5	15	8	30	15
6	20	10	40	20

The location in relation to openings and combustible materials of the vents on Group T2 tanks for other classes of liquids shall not be restricted, except the distance from openings of vents for liquids which give off obnoxious gases. In all such cases the location of vents shall be as required by the Buildings Engineer.

Venting T3 Tanks

Par. 9773. Every tank of Group T3 for Class I, II or III liquids shall be provided with one or more approved vents, the aggregate area of which shall be not less than that corresponding to the sizes shown in Paragraph 9782.

Vents for T3 tanks for all other classes of liquids shall be not less in size than that of the fill pipe.

Vent outlets for Group T3 tanks shall be located as required for Group T2 tanks in Paragraph 9772.

Venting T4 Tanks

Par. 9774. All Group T4 tanks shall be provided with approved vents of a size required in Paragraph 9782, but never less than the approved standard used in general practice for the class of liquid under corresponding conditions.

Fill and Discharge Piping for Tanks

Par. 9775. The intake end of fill pipes for Class I or II liquids shall be located as far as practicable from adjoining property lines but never less than 20 feet. The intake end of fill pipes for Class III liquids shall be located the same distance from adjoining property lines, openings, walls or combustible materials as is required for vents in Paragraph 9772. All drawoff pipes terminating inside of any building shall have valves easily accessible at the discharge end as well as at the tank end of the line, whether the liquid is delivered by gravity or by a pump.

Service storage tanks for oil burning equipment shall be provided with an overflow connection draining back to the main storage tank, or other tank approved by the Buildings Engineer. The overflow pipe shall be not smaller than the supply pipe, and shall not be equipped with a valve, trap or other obstruction.

Storage Tank Pumps

Par. 9776. Pumps used to handle Class I, II, III or IV liquids for the purpose of discharging such liquids either into or from a storage tank shall be located so that they will be accessible at all times, but never within any embankment or wall surrounding a tank, unless additional pumps serving the same purpose are located outside of such embankment or wall.

Filling Station Pumps

Par. 9777. All filling station pumps shall be of standard design and construction approved by the Chief of the Bureau of Standards of the City of Baltimore, and such pumps shall be inspected and sealed by a representative of such Bureau before being put in service.

All hose or tubing used to handle gasoline or motor fuel shall have a continuous metal connection which will electrically ground the pump and car tank whenever such hose or tubing is discharging gasoline or motor fuel into motor vehicle tanks.

Pumps or other tank filling devices shall be so constructed as not to allow any Class I, II or III liquid to remain in any glass measure for a period longer than is necessary to complete an intermediate delivery. This regulation shall not be construed to prohibit the use of a sight glass or other device which does not contain more than one quart of liquid and which is used for the purpose of making certain that no liquid is being lost in delivery or is escaping through leaky lines, pipes or valves.

Filling station pumps shall not be located within 10 feet of any wall, except solid masonry walls and walls of buildings used for filling station purposes only. They shall be further restricted as to location as follows, all distances to be measured from center line of pump at a point 5 feet above the base:

a. Pumps shall not be placed less than 15 feet from any wood or other combustible construction.

b. Pumps shall not be placed nearer than 4 feet horizontally nor 10 feet vertically from any door, window or other opening in a wall of any building, except buildings used for filling station purposes only. Where a pump is placed more than 4 feet, but less than 8 feet, horizontally or more than 10 feet, but less than 20 feet, vertically from a door, window or other opening, such opening shall be protected by fire-resistive windows or Class A fire doors.

c. Pumps shall not be permitted less than 10 feet from a street or adjoining property line, unless separated therefrom by a fire wall not less than 8 feet high, measured from the base of the pump, and extending not less than 5 feet beyond the pump on each end.

When filling station pumps are installed in a driveway within a building which is not a part of the filling station, that portion of the building enclosing the driveway shall be considered a hazardous Commercial occupancy and shall be separated from the rest of the building as required in Section 407. The openings in such separations shall be protected by water curtains in addition to the protection required in Section 407.

Pumps enclosed entirely within a building shall be protected by a Class A sprinkler system constructed as required in Section 983, covering the entire area within a radius of 20 feet from the pump.

Loading Stations for Liquids

Par. 9778. At marketing stations and elsewhere, truck loading racks for Class I and Class II liquids shall be separated from tanks, warehouses, and other plant buildings, by a clear distance of not less than 20 feet.

Truck loading racks for Class I or II liquids shall never be placed inside of a building, in narrow alleys or other confined spaces, but shall always be placed in the open where ventilation is free and unobstructed for a distance of at least 50 feet, measured on an approximately straight line in both directions from the rack.

Loading racks for tank trucks shall be provided with bonding cables for use during all loading of Class I, II or III liquids. Electric contact shall be maintained between the rack and the vehicle during the filling operation.

At all loading racks the area including the space on which the truck stands, the rack and platform shall be drained to a central point or the entire area over which trucks stand shall be enclosed with a curb not less than 6 inches high.

Filling lines shall have proper block valves at the terminals, at the tanks, at the shore for marine stations and at the loading points. Manifolds shall be in safe and accessible locations.

SECTION 978

SPECIAL SAFETY REGULATIONS FOR TANKS

Scope of Safety Regulations for Tanks

Par. 9780. Safety regulations for tanks shall include all requirements for electrical work, fire protection, and other special safety requirements for the safe storage and operation of tanks for flammable liquids.

Electrical Work for Tanks

Par. 9781. Every electric motor, wiring, switch, receptacle, light socket and all other electrical equipment and grounding, less than 50 feet, or within 100 feet in the line of vapor travel, from any tank for Class I, II or III liquid, shall be of approved explosion-proof type, in accordance with the requirements of Part VIII of this Code.

Emergency and Other Vents for Tanks

Par. 9782. The size of emergency or other vents, required for tanks in Section 977, shall be not less than those shown in Table 9782T.

TABLE 9782T

Capacity of Tank Gallons	Approximate diameter of free circular opening, unobstructed by valve discs or similar obstructions for the following allowable internal pressures, or less			
	3 inches of water	1 pound per square inch	9 pounds per square inch	15 pounds per square inch
1,000 or less	4 inches	2½ inches	1½ inches	1 inch
4,000 “	6¾ “	3¾ “	2¼ “	1¾ inches
18,000 “	9½ “	5½ “	3¼ “	2½ “
25,000 “	10¼ “	6 “	3½ “	2¾ “
56,000 “	12¾ “	7¼ “	4¼ “	3¼ “
100,000 “	15¼ “	8¾ “	5 “	4 “
155,000 “	17¼ “	9¾ “	5¾ “	4½ “
222,000 “	18¼ “	10½ “	6 “	4¾ “
475,000 “	20 “	11¼ “	6¾ “	5 “
735,000 “	20½ “	11½ “	6¾ “	5¼ “
Over 735,000	20½ “	11½ “	6¾ “	5¼ “

Where a weighted manhole cover, or a weak seam in the roof or at the joint between the roof and the shell is provided, the clear diameter shown in Table 9782T may be reduced to not less than that of the fill pipe.

Emergency Reservoirs for Tanks

Par. 9783. All tanks containing Class I, II or III liquids, crude oil petroleum or other liquids which have a tendency to boil over, shall be completely surrounded by a properly constructed earth dike, reinforced concrete or masonry wall forming a reservoir having a capacity of more than that of the tank or tanks surrounded, except that such reservoirs are not required around tanks containing less than 20,000 gallons of flammable liquids.

When dikes or walls surrounding tanks containing crude oil, petroleum, or other similar liquids having a tendency to boil over or where emergency reservoirs cannot be made of the size required in Paragraph 9783, a steel deflector, extending around the entire perimeter, shall be constructed on the top of the dike or wall to minimize the effect of the "boil over" wave. The deflector shall be not less than 12 inches in width and slope inwardly at an angle of 45 degrees, meeting the top of the wall or dike at the inside edge.

Earth dikes shall have a flat section at the top not less than 2 feet wide for dikes 4½ feet or less in height, and not less than 3 feet wide for dikes over 4½ feet high, and sides sloped not steeper than one and one-half feet horizontal to one foot vertical. The earth in dikes shall contain not more than 35 per cent of stone or gravel and shall be firmly compacted so as not to leak.

Such reinforced concrete or masonry walls shall be designed as retaining walls resisting a hydrostatic pressure of a reservoir full of water. All such reinforced concrete or masonry walls over 150 feet long shall have oil tight expansion joints of flexible copper at intervals of not exceeding 150 feet. The footings of such walls shall be not less than 3 feet below grade.

In all cases where emergency reservoirs are required to be provided, the dike or retaining wall shall be equipped with a manually controlled drain having a diameter not less than that shown in Table 9783T.

TABLE 9783T

Aggregate capacity of tanks within the dike, in gallons	Nominal diameter of drain in inches
400,000 or less	6
1,600,000 or less	8
Over 1,600,000	10

No dike or wall shall be less than 10 feet from any adjoining property line or building.

All dikes, walls and deflectors shall be maintained in good condition as long as any liquid is stored in the tanks within the dikes.

Fire Extinguishing Appliances for Tanks

Par. 9784. Every Group T3 tank used for the storage of Class I or II liquids, with a capacity of over 50,000 gallons, shall be equipped with a foam fire extinguishing equipment having either portable or fixed applicators or outlets.

Drainage Around Tanks

Par. 9787. A drainage system shall be provided around all Group T3 tanks and around all Group T4 tanks having a capacity of more than 30,000 gallons. The drains around such tanks for Class I, II, III or IV liquids shall be so arranged and equipped that water may be separated from the oil and drawn off into a catch basin or other tank.

All connections between reservoirs and any sub-surface drainage system shall be so arranged as to prevent the flow of flaming liquids or gases from entering any such drainage systems.

Oil Level Gauging Devices for Tanks

Par. 9788. A test well or gauging device shall be installed on all tanks used for Class I, II, or III liquids, so designed as to prevent escape of liquids or vapors through such device, when closed.

The top of a well or a guaging device shall be kept shut when not in use, and the top shall not be located in any building.

Glass gauge devices shall not be permitted below the liquid level except by written permission of the Buildings Engineer.

Openings in tanks for cleaning purposes shall not be used for measuring, discharging or filling of such tanks.

SECTION 979

EXISTING TANKS

General Requirements for Existing Non-Conforming Tanks

Par. 9790. The provisions of Section 979 of this Code shall apply to any and all tanks, piping, equipment, appurtenances thereto, which have been constructed, erected, installed or used prior to the date of the passage of this Code.

No tank, pipe, equipment or any appurtenances thereto, which has been erected or installed prior to the date of the passage of this Code shall be again erected or installed unless such tank, pipe, equipment or appurtenances thereto conform to the requirements of this Code.

Whenever the use of any tank, pipe, equipment or appurtenances thereto is discontinued or abandoned for a period of more than one year, such tank, pipe, equipment or appurtenances thereto shall not be again used unless such tank, pipe, equipment or any appurtenances thereto conforms to or is made to conform to the requirements of this Code.

Non-Conforming Location of Existing Tanks

Par. 9791. Existing tanks which do not conform to the requirements of this Code relative to the location of such tanks shall be permitted to remain or continue in their present location, but such tanks shall neither be added to, replaced nor renewed.

Existing Non-Conforming Foundations and Supports.

Par. 9792. Tank foundations or supports, which do not conform to the requirements of this Code, shall be made to conform thereto where the condition of such foundations or supports are or create a menace to either life or any adjoining property.

Existing Non-Conforming Metal Tanks

Par. 9793. Existing metal tanks which do not conform to the requirements of this Code shall be permitted to continue in use but such tanks shall not be permitted to be added to.

Existing Non-Conforming Wood Tanks

Par. 9794. Existing wood tanks which do not conform to the requirements of this Code shall be made to conform thereto when such tanks are replaced or altered.

Existing Non-Conforming Concrete Tanks

Par. 9795. Existing concrete tanks which do not conform to the requirements of this Code shall be made to conform thereto when such tanks are replaced or altered.

Existing Non-Conforming Piping and Equipment

Par. 9796. Existing piping or equipment which does not conform to the requirements of this Code shall be made to conform thereto when any change or changes are made in such piping or equipment.

Existing Non-Conforming Safety Devices

Par. 9797. Existing safety devices on tanks, piping or equipment which do not conform to the requirements of this Code shall be made to conform thereto within a period of one year from the date of the passage of this Code.

CHAPTER 98

FIRE EXTINGUISHING APPLIANCES

Sec. 980—General Requirements for Fire Extinguishing Appliances
Sec. 981—Standpipe Systems.
Sec. 982—Foam Systems.
Sec. 983—Automatic Sprinkler Systems.
Sec. 985—Water Curtains.
Sec. 986—Special Fire Extinguishing Systems.
Sec. 987—Portable Fire Extinguishers.
Sec. 988—Inspection and Tests for Fire Extinguishing Appliances.
Sec. 989—Maintenance and Operation of Fire Extinguishing Appliances.

SECTION 980

GENERAL REGULATIONS FOR FIRE EXTINGUISHING APPLIANCES

Scope and General Regulations for Fire Extinguishing Appliances

Par. 9800. The regulations in Chapter 98 of this Code constitute the minimum requirements for the design, construction, installation, operation, maintenance, tests and inspection of required fire extinguishing appliances such as standpipe systems, automatic sprinkler systems, foam systems, water curtains, special fire extinguishing systems, portable fire entinguishers, and other fire extinguishing appliances in buildings and other structures.

Application shall be filed and permits obtained for the installation and alteration of fire extinguishing appliances as required in Part I.

Fire extinguishing appliances or systems shall be installed where required in Part IV and other parts of this Code.

All electric wiring necessary for the operation of fire extinguishing systems shall be installed in accordance with Part VIII. The rigid metal conduit wiring system shall be used and the conduits shall be so located as to afford a maximum protection against fire damage to the conductors.

Drawings for Fire Extinguishing Appliances

Par. 9802. Complete drawings or diagrams of all fire extinguishing systems shall be submitted for approval when applying for a permit as required in Paragraph 1362.

Details of Fire Extinguishing Appliances

Par. 9808. The details of the design, construction and installation of all fire extinguishing appliances, where not specifically provided for in this Code, shall be in accordance with the regulations of the National Board of Fire Underwriters for fire extinguishing appliances, and such details shall be approved by the Buildings Engineer.

Existing Fire Extinguishing Appliances

Par. 9809. Existing fire extinguishing equipment or appliances required by the provisions of this Code and which do not conform to the requirements of Chapter 98 of this Code shall be made to conform thereto if they create an imminent hazard to life or property.

SECTION 981

STANDPIPE SYSTEMS

General Regulations for Standpipe Systems

Par. 9810. A copy of all required drawings or diagrams of every standpipe system shall be submitted to the Board of Fire Commissioners for examination and recommendation before the Buildings Engineer issues a permit for the installation of any standpipe system.

Such drawings or diagrams shall show the plan and description of the system; the location, size and length of all risers, cross connections, headers and yard connections; the locations and sizes of all valves and supply hose connections; the locations of hose stations including the size and length of hose, the type of rack and hose cabinet; the size, capacity, material and location of every tank, including all connections; all pumps and the make, rated capacity and the character of driving mechanism indicated.

Standpipe systems shall be divided for the purpose of this Code into three classes, as follows:

1. First Aid Standpipe System. This type of system is a system of piping supplied at all times with water under pressure and equipped with at least one-and-one-half-inch hose outlets with hose connected thereto for extinguishing fires by the occupants of the building.

2. Fire Department Standpipe System. This type of system is a system of piping equipped with two-and-one-half-inch hose outlets supplied with water only by pumping engines of the Fire Department through standard Fire Department siamese connections.

3. Standard Standpipe System. This type of system is a system of piping supplied at all times with water under pressure equipped with a Fire Department siamese connection and also equipped with two-and-one-half-inch hose outlets for use by the Fire Department and also equipped with one-and-one-half-inch hose outlets with hose connected thereto for the use of the occupants of the building.

Location, Layout and Connections for Standpipe Systems

Par. 9811. Standpipes in a Fire Department Standpipe System shall be located in or near fire-resistive stair shafts, exterior stairways, or fire towers.

Where standpipes are exposed to the injurious effect of heat from fire, such as from furnaces, they shall be protected to the satisfaction of the Buildings Engineer.

Standpipes shall not be permitted in high tension transformer rooms and switchboard rooms unless they are completely enclosed in a standard weight steel or wrought iron pipe, or are more than 25 feet from any transformer or other electric equipment.

All standpipes shall be firmly supported by approved brackets and hangers so as to prevent vibration when the system is in use.

Connections to tanks shall be made at the tops of the standpipes, except that standpipes in different buildings shall be supplied from a common underground header. The supply pipes shall be not less in size than the standpipes to which they connect.

Connections from pumps and sources of water supply outside of the building shall be made at the bottom of the standpipes and shall be sufficient in size to deliver the necessary quantities without excessive friction loss.

Where more than one riser forms a system in a building, they shall be cross-connected at the bottom, and where they are supplied from tanks in the same building, they also shall be cross-connected at the top. Cross-connecting pipes shall have a size at least as large as the largest riser they connect into.

All portions of a standpipe system shall be protected from freezing.

Size and Strength of Pipes in Standpipe Systems

Par. 9812. Standpipes having 2½ inch hose outlets shall be not less than the following size:

4-inch for buildings of 6 stories or less, or not over 75 feet in height.

6-inch for buildings exceeding 6 stories, or 75 feet in height.

Standpipes having 1½ inch hose outlets shall be not less than the following size:

2-inch for buildings not exceeding 4 stories, or 50 feet in height, and 2½-inch for buildings over 4 stories or 50 feet or more in height.

Standard weight or heavier wrought iron or steel pipe shall be used for working pressures not exceeding 175 pounds per square inch. For working pressures of 175 pounds or more per square inch, extra strong wrought iron or steel pipe shall be used.

Wrought iron pipe shall comply with the "Standard Specifications for Welded Wrought Iron Pipe" of the American Society for Testing Materials, Serial Designation A72-38.

Steel pipe shall conform to the "Standard Specifications for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Ordinary Uses", of the American Society for Testing Materials, Serial Designation A120-36.

Cast iron pipe shall conform to the specifications of the American Waterworks Association, 1908.

Valves and Fittings for Standpipe Systems

Par. 9813. In standpipe systems, check valves coupled with gate valves shall be provided on connections to each water supply, other than the Fire Department siamese connections, to tanks, pumps, to the water supply system, with the gate valves placed on the system side of the check valve. An additional gate valve shall be required on the supply side of the check valve if more than one water supply is provided. These check valves shall be located as near to the supply as practicable.

Where the system consists of more than one standpipe, each standpipe shall be provided with one gate valve at the base of the riser.

A straightway check valve shall be provided in each Fire Department siamese connection. The piping between this check valve and outside hose connection shall be arranged to drain automatically.

No valve or outlet shall be located in a high tension transformer room or switchboard room.

Gate valves and check valves of the extra heavy flanged type shall be used where the working pressure is in excess of 175 pounds per square inch.

All valves shall be of a type approved by the Underwriters' Laboratories, Incorporated, or the Buildings Engineer.

Fittings used in standpipe systems shall be made of cast iron or cast steel and shall be of the extra heavy pattern where the working pressure exceeds 175 pounds per square inch. They shall be of the flanged type for sizes larger than six inches. Cast iron fittings shall be made in accordance with the American Waterworks Specifications, 1908.

Wherever necessary, expansion joints of a type approved by the National Board of Fire Underwriters and the Buildings Engineer shall be provided.

A standard 4½-inch dial spring pressure gauge with a control valve and drainage arrangements shall be connected at the following locations:

At the connection to the water supply system;
At the discharge of each fire pump;
At the top of each standpipe in standard standpipe systems;
At the pressure tank;
At the air pump.

All standpipe systems shall be provided with drains of sufficient capacity and number to drain all water from the system under pressure. They shall discharge into a place where no water damage may be caused.

Hose Stations for Standpipe Systems

Par. 9814. Hose outlets and valves in standpipe systems shall be within easy reach from the floor level and in no case higher than 6 feet from the floor. All outlets for the use of the Fire Department shall be capped, if no hose is attached to them. All hose stations in Standard and Fire Department Standpipe Systems shall be provided with at least one 2½-inch nominal diameter hose outlet with a 2½-inch National Standard male thread.

Hose stations in a Fire Department Standpipe System shall be located within fire-resistive stair enclosures, if practicable.

Hose outlets for first aid stations shall be located in passageways or near exits.

Branch lines used to connect hose outlets to standpipes shall be provided with a shut-off valve near the riser.

All hose stations shall be provided with control valves. Control valves of the gate valve type shall be provided with suitable open drips. Control valves for hose outlets on the roof not inclosed in a heated space shall be located in a horizontal run of piping under the roof with a stem extending through the roof. This stem shall be equipped with a wheel handle placed at least 12 inches above the roof.

Hose provided for the use of persons trained in handling it shall be 2½-inch unlined linen, except that in shipyards, oil storage plants, lumber yards, amusement parks and exhibition halls, or where unlined linen hose is exposed to deterioration, 2½-inch rubber lined cotton hose or rubber hose may be used.

The length of hose shall be such that the hose stream will cover the entire area to be protected, but shall not exceed 100 feet when provided for the use of trained persons. Where the hose is intended for the use of untrained persons, such as at first aid stations, its length shall not exceed 75 feet.

The hose at each station shall be mounted on a hose rack of a type approved by the National Board of Fire Underwriters and the Buildings Engineer. All hose racks shall be securely fastened in position.

Each rack provided with a hose intended for the use of trained persons shall bear a permanent conspicuous sign, with lettering in red, reading: "FOR FIRE DEPARTMENT USE ONLY". Where the hose station is located within a closet or solid cabinet, the sign shall be mounted on the outside of the closed doors.

All hose shall be coupled to the hose outlets or hose valves.

Nozzles at the end of the hose shall be of a type approved by the National Board of Fire Underwriters and the Board of Fire Commissioners. Nozzles for 1½-inch hose shall not be over ⅝ inch size, and nozzles for 2½-inch hose shall be one inch or 1⅛ inch in size.

Where the water pressure at the hose outlets exceeds 55 pounds per square inch when the water is flowing at the required rate, an adjustable type reducing device shall be provided to reduce the water pressure on the downstream side to 50 pounds per square inch.

Water Supply for Standpipe Systems

Par. 9815. Every Standard and First Aid Standpipe System shall be connected to a satisfactory supply of water which will keep the system filled under a pressure sufficient to furnish the quantities at each hose outlet as required in

Paragraph 9815. Water may be supplied from one or more of the following sources:

1. Direct water supply system of Baltimore City.
2. Automatic Fire Pumps.
3. Manually controlled fire pumps, with pressure tanks.
4. Pressure Tanks.
5. Gravity Tanks.

Where one water supply is used, this shall be automatic. Where two water supplies are used, at least one of these shall be automatic; that is, it shall supply streams of required magnitude at hose outlets when the hose control valves are opened, until the non-automatic supply can be brought into action.

The water supply for standpipes equipped with 2½-inch hose shall be sufficient to supply each riser with 250 gallons per minute, and shall be able to maintain a pressure of not less than 20 pounds per square inch for at least 30 minutes at the topmost hose outlet, other than roof outlet, when water is discharged through a 50-foot long 2½-inch rubber lined cotton hose and a 1⅛-inch nozzle.

The water supply for standpipes equipped with 1½-inch hose shall be sufficient to supply each riser with 35 gallons of water per minute discharging at a pressure of at least 25 pounds per square inch at the topmost hose outlet. The supply shall be sufficient to provide for continuous operation of two hose streams for at least 30 minutes.

Where separate risers with separate gravity or pressure tanks, or fire pumps, are used, respectively, for the lower and higher parts of a building, such risers shall be so cross-connected that each hose outlet may be supplied from every Fire Department siamese connection and every fire pump in the building.

All Fire Department and Standard Standpipe Systems shall be provided with a Fire Department siamese connection. Where such systems are in buildings facing two streets, there shall be at least one such connection on each front. Buildings facing more than two streets, and having less than 300 feet total frontage, shall have at least two such hose connections. Buildings with a total frontage of more than 300 feet shall have at least one such hose connection on each front.

Fire Department siamese connections shall be of a size required and as directed by the Board of Fire Commissioners. All such connections shall have 2½-inch National Standard female threads for attaching the supply hose. The couplings shall be of bronze and provided with caps.

Fire Department siamese connections in Standard Standpipe Systems shall be attached to the main supply pipe, on the system side of the main shut-off valve.

Gravity and Pressure Tanks for Standpipe Systems

Par. 9816. Gravity tanks supplying a First Aid Standpipe System shall have a minimum capacity of 3500 gallons. Gravity tanks supplying a Standard Standpipe System shall have a minimum capacity of 5000 gallons. These capacities shall be reserved for the standpipe systems exclusively when such systems are supplied by tanks serving other purposes.

Pressure tanks used as a water supply shall have the same capacity as required for gravity tanks, and the air pressure therein shall be maintained between 70 and 80 pounds per square inch. The bottom of pressure tanks shall be above the highest hose outlet other than roof outlets.

Each system serving a building shall have a separate tank, except that where a group of buildings is operated by the same tenant or owner, a single gravity or pressure tank may be used as a water supply for all standpipe systems, in which case a dead riser shall connect the bottom of the tank with an underground header from which the individual standpipe systems are supplied. Such tanks shall have a sufficient capacity to supply the largest of the systems in the group.

Where lumberyards, shipyards, oil storage plants, or amusement parks are protected with a system of hose stations and the water supply system of Baltimore City is not adequate to furnish sufficient water as required in this Chapter, tanks or fire pumps shall be provided with sufficient capacity to supply each hose station with the required amount of water for at least one hour. Where tanks are used, the bottom of these shall be at least 100 feet above the yard or 50 feet above the highest structure. The tanks and pumps may be supplied from wells and rivers if the water is sufficiently clean.

Tanks shall be filled through a pipe at least 2 inches in size, which pipe shall not be a part of the standpipe system. The rate of filling shall be at least 65 gallons per minute. Fire pumps, if required in the system, shall not be used for filling of tanks. When the filling pump of a gravity tank is not automatic, the tank shall be equipped with an electric device giving an alarm signal when the water in the tank falls below the capacity required for the system. Where the airpump is not automatic, the pressure tank shall be provided with an electric alarm device giving a signal when the air pressure drops below 70 pounds per square inch.

All gravity tanks shall have on overflow drain of one size larger than the pipe used to fill the tank. The overflow shall discharge into a place where no damage will result from the water. Each gravity and pressure tank shall also be provided with an emergency drain with an appropriate valve.

All tanks shall be equipped with a water gauge, visible from the outside, of a type approved by the National Board of Fire Underwriters and the Buildings Engineer. Pressure tanks shall also be provided with a device which shall indicate that the tank is 2/3 full.

Where exposed to freezing, the water in the tank and in the piping shall be protected by methods described in Par. 9838.

All tanks shall conform to the requirements in Chapter 97 of this Code as to material, construction, supports and workmanship.

Fire Pumps and Air Pumps for Standpipe Systems

Par. 9817. The minimum capacity of a fire pump in a Standpipe System shall be 500 gallons per minute.

All fire pumps shall deliver their rated capacity at a minimum pressure of 100 pounds per square inch at the pump discharge.

All fire pumps shall be located at or near the ground level on a masonry base at least 12 inches above the pump room floor and so located that the pump shall be easily accessible from all sides.

Where a steam engine furnishes driving power to a fire pump, a steam pressure of at least 50 pounds per square inch shall be maintained at all times at the pump.

The connection from an electrically driven fire pump to the electric feed line shall be made ahead of the main service switch, unless a separate feeder from the electric power station is installed.

Airpumps shall be constructed so that they are able to build up the air pressure in the pressure tank to 75 pounds per square inch in less than 3 hours.

All pumps shall be of a type approved by the National Board of Fire Underwriters and the Buildings Engineer.

Standpipe Systems for Buildings Under Construction

Par. 9818. All buildings under construction shall be equipped with a temporary or permanent Fire Department Standpipe System as required in Paragraph 2481.

Size and strength of the risers shall be in accordance with Paragraph 9812.

The number of risers shall be so determined that it shall be possible to install at least two 2½-inch hose connections on every floor, so placed that the whole floor can be reached with the hose stream.

At least two 4-inch Fire Department standard siamese connections shall be provided at the ground floor, easily accessible and conspicuously marked.

The risers shall be carried up with every floor and shall be capped at all times. All risers shall be firmly supported at every other floor.

All hose outlets shall be provided with a control valve.

The temporary standpipe system shall remain in place until the permanent standpipe installation is completed.

Stairways shall be maintained during construction of any building or other structure in order that the Fire Department may have easy access to the hose outlets throughout the whole building or other structure under construction. When the construction of a building has reached a height of 150 feet an elevator shall be maintained for the use of the Fire Department.

SECTION 982

FOAM SYSTEMS

General Requirements for Foam Systems

Par. 9820. A foam system consists of pipes, outlets and release devices, connected to a source of supply, and serves to extinguish a fire of flammable liquids by covering their surfaces with foam bubbles containing an incombustible gas. Foam systems shall be classified in this Code according to the hazards they protect as follows:

Class A Systems for outdoor hazards.

Class B Systems for indoor hazards not susceptible to ordinary automatic sprinkler protection.

Class C Systems for local indoor hazards in rooms or buildings which have other approved fire protection and for minor outdoor hazards.

Class B and Class C Systems shall be automatic.

General Requirements for the Supply of All Foam Systems

Par. 9821. The foam producing material for all foam systems shall be such that it will not deteriorate with age and will produce a tenacious foam consisting of minute long lasting bubbles filled with an incombustible gas, which bubbles are not easily broken down by vigorous agitation or intense heat. The foam shall be such as to float on liquid surfaces and adhere to solid surfaces and shall not be more injurious to persons and merchandise than water.

In calculating the amount of foam producing materials, and where no other data are available, it shall be assumed that in order to produce 7½ gallons of foam, one pound of dry chemicals and one gallon of water are necessary, or where two solutions are used, one gallon of the combined solution, having an expansion of eight at room temperature, is necessary.

The delivery of the supply shall be either from manually controlled pumps or automatic pumps, air pressure tanks, chemically generated pressure tanks, gravity tanks, generators or other approved sources.

Where automatic pumps are used, they shall be arranged to start by the heat of the fire.

Pressure tanks shall have a compressed air capacity at least half of that of the liquid capacity and the pressure carried shall be not more than 150 pounds per square inch.

The bottom of gravity tanks shall be at least 5 feet above the highest outlet.

Where automatic release of the foam producing materials is used and the system is located in a room equipped with an automatic sprinkler system, provisions shall be made to insure the application of the foam before the operation of the sprinklers.

All foam producing material, the means of delivery, supply tanks, pumps and releasing devices shall be of type approved by the National Board of Fire Underwriters and the Buildings Engineer. Tanks shall also conform to the requirements of Chapter 97.

General Requirements for Pipes and Outlets of All Foam Systems

Par. 9822. The pipes for all foam systems shall be installed in a manner required for sprinkler systems so far as these requirements apply. Pipes shall be provided with means for flushing out with clean water. The pipes shall be pitched one-half inch in 10 feet and outlets so provided that the system may be drained.

All pipes shall be protected against corrosion and pipes normally filled with solution shall also be protected against freezing.

Discharge outlets shall be of such type, number and location as to deliver the foam evenly over the whole area to be protected.

All valves, outlets and alarm devices shall be of a type approved by the National Board of Fire Underwriters and the Buildings Engineer.

Supply for Class A Foam Systems

Par. 9823. In addition to the general requirements in Paragraph 9821, the supply for Class A foam systems shall conform to the requirements contained in Paragraph 9823.

A suply of foam producing materials shall be maintained for prompt and continuous delivery in the apparatus to produce an amount of foam which will cover sufficiently the largest individual liquid surface to be protected, plus an amount necessary for the hose stations, where such are provided, and an amount to fill the discharge line to the most distant tank.

The number of gallons of foam per square foot considered sufficient to protect a liquid surface shall be as shown in Table 9823T1.

TABLE 9823T1

Type of Liquid	Type of Discharge Outlet				Remarks
	1	2	3	4	See Note
Lubricating oils; dry viscous petroleum residuum; and dry fuel oils with flash point above 175 degrees Fahrenheit, closed cup tester....................	15	25	35	50	
Kerosene; light furnace oils; Diesel fuels; and similar oils..............	20	30	45	60	
Gasoline; naphtha; benzol; and similar liquids with flash point below 100 degrees Fahrenheit, closed cup tester..	25	50	60	80	
All crude petroleums..................	30	50	60	80	

Note: Refer to Paragraph 9824 for explanation of discharge outlet types.

The amount of foam considered necessary for hose stations serving as additional protection for tanks shall be not less than that shown in Table 9823T2.

TABLE 9823T2

Diameter of largest tank to be protected, in feet	Gallons of Foam
Up to 35	5,000
35 to 65, inclusive	10,000
Over 65	20,000

Where only horizontal or spheroidal tanks are to be protected by hose stations, at least 2,000 pounds of foam producing material shall be maintained for prompt and continuous delivery.

The amount of foam considered sufficient to fill the discharge lines to the most distant tank shall be not less than that shown in Table 9823T3.

TABLE 9823T3

Size of Discharge Line in Inches	Gallons of Foam for Every 100 Feet of Double Line
4	990
6	2,250
8	3,915

Discharge lines of 3-inch size or less, and lines for single powder foam systems are not required to be considered. Quantities for lines less than 100 feet in length shall be calculated proportionately.

The supply of foam producing liquids shall be maintained at a temperature that will not inhibit normal chemical action. Dry foam producing chemicals shall be stored in approved moisture-proof containers in a manner to prevent abnormal deterioration.

Fixed supply equipment, except tanks, shall be located in a detached incombustible structure, or in rooms separated from the other parts of the building by a four-hour fire-resistive construction with no openings therein. Solution storage tanks shall be located near the pumps and where not exposed by the hazard protected.

The delivery equipment shall be such as to be capable of discharging not less than three-quarters of a gallon of foam per minute for every square foot of the largest individual liquid surface to be protected, but at least 500 gallons per minute.

In wet storage systems, facilities separate from storage tanks shall be provided for dissolving and preparing the foam producing materials. Where pumps are used in connection with two solution systems, they shall be so arranged as to make it impossible to deliver other than the proper proportions of each solution.

Pipes and Outlets for Class A Foam Systems

Par. 9824. In addition to the general requirements in Paragraph 9822, the piping and outlets in Class A foam systems shall conform with the requirements contained in Paragraph 9824.

In determining the necessary size of pipe, carrying foam solutions or water, the friction loss shall be calculated by the Hazen and Williams formula using a value of c=100.

The maximum length and minimum size of pipe, carrying foam in single foam line systems with 75 pounds per square inch flow pressure, shall be as shown in the following table:

TABLE 9824T

Foam Discharge in Gallons per Minute	Foam Pipe Lines Only		Foam Pipe Lines in Combination with Hose Lines			
	Min. pipe sizes in ins.	Max. pipe lengths in feet	Min. pipe sizes in ins.	Max. pipe lengths in feet	Min. diam. of hose in ins.	Max. length of hose in feet
Up to 300	2	150	2	100	1½	50
300 to 1000	3	200	3	150	2½	50
1000 to 1500	4	400	4	350	2½	50

For flow pressure of other than 75 pounds per square inch, the lengths and pipe sizes shall be varied accordingly.

Two-solution systems shall have a double foam piping system normally empty, and the solution shall be delivered into the piping only in case of fire. The length and size of such piping shall meet the approval of the Buildings Engineer.

Inlets to piping to be supplied by portable generators shall be located at a distance from the tank to be protected at least equal to the diameter of the tank, but never less than 50 feet.

Control valves normally in contact with corrosive liquids shall be made of or fitted with corrosion-resistive materials. All such valves shall be of the indicating type. In wet storage systems, each suction and discharge pipe from the pumps shall be provided with a control valve. In two-solution dry storage systems, the water inlet to each generator, and the main water supply line shall be provided with a shut-off valve. Control valves shall always be located outside of dikes and their distance from the tank they serve shall not be less than the diameter of the tank, but never less than 50 feet, unless protected to the satisfaction of the Buildings Engineer. Each set of control valves shall be provided with an indicator board clearly showing the system which they control.

Discharge outlets shall be classified into the following types:

Type 1. Portable or fixed outlets which under severe conditions will deliver foam without undue submergence or undue agitation of the surface of the liquid to be protected.

Type 2. Fixed outlets not supplemented with means for delivering foam without undue submergence or undue agitation of the surface of the liquid to be protected.

Type 3. Portable outlets which may be raised into place with a minimum of man power, and are capable of discharging foam into the tallest of the tanks to be protected.

Type 4. Outlets on hose.

All discharge outlets shall be of a type approved by the Buildings Engineer. Tanks to be protected having a diameter of 65 feet or less shall have at least one discharge outlet; tanks with a diameter of more than 65 feet but less than 117 feet 6 inches shall have at least 2 outlets; and tanks with a diameter of 117 feet 6 inches or more shall have three Type 2, 3 or 4 outlets or two Type 1 outlets. Fixed discharge outlets shall be securely attached to the tank, and so installed that movements resulting from the distortion of the tank, caused by fire or explosion, shall not disarrange the device, and that the liquid to be protected may not flow into the delivery pipe lines. Fixed outlets attached to tanks containing volatile liquids shall be protected against the entrance of vapors into the pipe lines.

Hose Stations in Class A Foam Systems

Par. 9825. Foam hose streams shall be considered adequate only for the protection of stills, horizontal cylindrical tanks, vertical tanks having a diameter of not more than 20 feet and a height of not more than 30 feet, and for supplementary use in extinguishing fires of burning liquid on the tank roof members, on buildings or on the ground.

There shall be at least two hose stations for each tank to be protected located not nearer than 50 feet from the tank shell, where practicable. Facilities shall be provided for at least two hose streams to protect a tank of 65 feet or greater in diameter, and for at least one hose stream to protect a tank of less than 65 feet in diameter.

The delivery equipment for one hose stream shall be capable of delivering not less than 500 gallons of foam per minute when all other outlets are shut off, with a nozzle pressure sufficient to insure a 50-foot stream.

Hose for two-solution systems shall be of the twin-line type with mixing tubes and playpipes attached.

Suitable conspicuous markers shall indicate the location of each hose station.

The hose shall be rubber lined.

The exact location of hose stations and control valves, and the length of hose provided, shall be subject to the approval of the Chief Engineer of the Fire Department.

Supply for Class B Foam Systems

Par. 9826. In addition to the general requirements in Paragraph 9821, the supply of Class B foam systems shall conform to the requirements contained in Paragraph 9826.

A supply of foam producing materials shall be maintained for immediate delivery sufficient to furnish upon the area to be protected in any one fire area a blanket of foam not less than 6 inches deep, plus an amount depending on local conditions.

The apparatus delivering the supply shall be preferably not located in the same fire area containing the hazard which it protects. Such apparatus shall be capable of discharging not less than 1.28 gallons of foam per minute for every square foot of the liquid area to be protected.

Pipes and Outlets for Class B Foam Systems

Par. 9827. In addition to the general requirements in Paragraph 9822, the piping and outlets of Class B foam systems shall conform to the requirements contained in Paragraph 9827.

Pipes shall be securely supported and, in rooms where explosions are possible, they shall be hung from supports other than the roof or ceiling.

For double pipe systems carrying liquid to mixers or to discharge outlets, the maximum number of one-half inch discharge outlets shall be as shown in Table 9827T1.

TABLE 9827T1

Pipe Size in Inches	Maximum Number of Discharge Outlets
½	1
¾	2
1	4
1¼	5
1½	9
2	18
2½	36
3	66
3½	100
4	146

This schedule shall be modified proportionately for other than one-half inch outlets.

For single pipe systems, and single pipes in combination systems, located between the mixer and hazards, the cross-sectional area of each pipe shall be at least twice the sum of all areas of the outlets it supplies. Applying this rule to one-half inch outlets, the maximum number will be as shown in Table 9827T2.

TABLE 9827T2

Pipe Size in Inches	Maximum Number of Outlets
¾	1
1	2
1¼	3
1½	5
2	8
2½	12

Control valves shall be located near the source of supply where they may be safely operated without exposure by the hazard protected.

Suitable alarms shall be installed and so arranged as to operate automatically whenever the heat release device or the supply goes into action.

Supply for Class C Foam Systems

Par. 9828. In addition to the general requirements in Paragraph 9821, the supply for Class C foam systems shall comply with the requirements contained in Paragraph 9828.

For liquid surfaces exceeding 25 square feet in area, a supply of foam producing materials shall be maintained for immediate delivery sufficient to furnish upon the area to be protected a blanket of foam not less than 4 inches deep, plus an amount depending on local conditions. For liquid surfaces of 25 square feet or less in area, the supply of foam producing materials to be maintained shall be not less than half of the amount specified above.

The apparatus delivering the supply shall be capable of discharging not less than 1.28 gallons of foam per minute for every square foot of the liquid area to be protected.

Pipes and Outlets for Class C Foam Systems

Par. 9829. In addition to the general requirements in Paragraph 9822, the piping and outlets for Class C foam systems shall comply with the requirements contained in Paragraph 9829.

The pipes shall be securely supported and, in rooms where explosions are possible, they shall be hung from supports other than the roof or ceiling.

For double pipe systems carrying liquid to mixers or discharge outlets, the maximum number of discharge outlets shall be as permitted for Class B systems in Paragraph 9827.

For single pipe systems, and single pipes in combination systems, located between the mixer and hazards, the maximum number of three-quarter inch outlets shall be as shown in Table 9829T.

TABLE 9829T

Pipe Size in Inches	Maximum Number of Outlets
¾	4
1	6
1¼	8
1½	10
2	12

Where other than three-quarter inch outlets are used, the pipe schedule shall be modified proportionately.

Class C foam systems shall be equipped with suitable alarms which will operate simultaneously with the release device or with the automatic action of the means of delivery, if required by the Buildings Engineer or the Board of Fire Commissioners.

Where hose stations are installed, they shall be in accordance with the requirements in Paragraph 9825.

SECTION 983

AUTOMATIC SPRINKLER SYSTEMS

General Regulations for Sprinkler Systems

Par. 9830. Automatic sprinkler systems are divided into the following types:

a. *Wet Pipe System:* This type of system is a system of pipes and automatic sprinklers filled with water under pressure at all times. When the sprinkler operates, due to the heating of air around it, the strut or levers are released and water is discharged.

b. *Dry Pipe System:* This type of system is a system of pipes and automatic sprinklers normally containing air under pressure instead of water. It is so arranged that when a sprinkler opens, the air escapes and water is emitted automatically by the operation of a dry pipe valve. After the valve operates, the entire system functions as a regular wet pipe system.

c. *Thermostatically Operated Closed Head System:* This type of system is a system of pipes and automatic sprinklers filled with air under one or two pounds of pressure. It is so arranged that through the medium of a thermostatically operated deluge or hydraulic valve, water is emitted to the piping system before the sprinklers operate. After the valve operates, the entire system functions as a regular wet pipe system.

d. *Thermostatically Operated Open Head System:* This type of system is a system of pipes and open sprinkler heads controlled by a quick opening mechanical or hydraulic valve or deluge valve, the latter being caused to operate automatically by a thermostat system.

Automatic sprinkler systems are also divided into Class A, Class B and Class C systems according to the hazard protected. They shall be installed in buildings and other locations when required elsewhere in this Code. Class A systems are designed to protect buildings with occupancies of the least hazardous nature, and Class C systems are designed to protect buildings with occupancies of the most hazardous nature.

For deluge systems, see Paragraph 9862.

Construction and Location of Sprinklers

Par. 9831. Closed sprinkler heads shall be of the ordinary degree rating with an activating temperature of about 135 degrees Fahrenheit for non-solder type and about 160 degrees Fahrenheit for solder type, except that in Industrial buildings or rooms where the manufacturing temperature exceeds these figures, sprinkler heads of intermediate or hard degree rating may be used.

Sprinkler heads shall be installed preferably in an upright position on top of piping. Where it is necessary to install sprinklers in the pendant position, they shall be of a type approved for that purpose.

Sprinkler deflectors shall be parallel to the under surfaces of floors, roofs and stairs, except under the peak of a roof, where they shall be horizontal. The minimum distance of deflectors from smooth ceilings, the bottom of slow-burning construction or the bottom of open joist construction shall be 5 inches and in no case more than 10 inches. Under fire-resistive floors or roofs this distance may be increased so as not to exceed 14 inches.

All sprinkler heads shall be of a type approved by the National Board of Fire Underwriters and the Buildings Engineer.

Sprinklers which are so located as to be subject to mechanical injury shall be protected by approved guards.

Where sprinklers are required, they shall be placed in all rooms and in all blind spaces enclosed on one or more sides by combustible construction, as in walls, floors or roofs, except where the space is less than 6 inches wide. The width of such blind spaces shall be taken as the clear distance between the opposite studs in walls or between the joists of floors and the ceilings below, or the joists of roofs and the ceilings below. Sprinklers shall also be installed in all spaces below a main entrance floor of combustible construction, if there is no basement below such floor, except that they may be omitted if all of the following conditions are complied with:

a. The spaces are not accessible for storage purposes.

b. The spaces do not contain any wiring, piping, conduits or equipment.

c. The main entrance floor is tight.

d. Flammable materials are not stored or handled in the story immediately above such spaces.

Where sprinklers are required, they shall also be placed under stairs, in shafts, in transmission and pulley boxes, in small enclosures, in chutes and in all cupboards and closets, unless the tops of any of the aforegoing places are open and they are so located that sprinklers from the room in which any of the aforegoing places are located may properly spray in them. Sprinklers shall be placed under decks and galleries which are more than three-and-one-half feet in width or if their clear distance from a wall is less than 6 inches. Fixed tables having a width of more than four feet but less than five-and-one-half feet shall be provided on the underside with sprinklers or with tight vertical partitions not more than 10 feet on centers. Such tables five-and-one-half feet or more in width shall be equipped with sprinklers on the underside.

The area covered by one sprinkler and the distance between sprinklers on one line and between sprinkler lines shall be not more than those shown in Table 9831T.

TABLE 9831T

Construction of Floors or Flat Roofs under which Sprinklers are located	Class A Systems			Class B Systems			Class C Systems			Remarks
	Area covered by one sprinkler Square Feet	Distance between sprinkler lines Feet	Distance between sprinklers on one line Feet	Area covered by one sprinkler Square Feet	Distance between sprinkler lines Feet	Distance between sprinklers on one line Feet	Area covered by one sprinkler Square Feet	Distance between sprinkler lines Feet	Distance between sprinklers on one line Feet	
Fire resistive in Type A and Type B buildings................	196	14	14	120	12	12	90	10	10	
Heavy timber in Type D buildings and any construction in Type C buildings, if width of bays is more than 5 feet, but not more than 12 feet.........	168	14	14	100	12	12	80	10	10	See Notes 1 and 2
Heavy timber in Type D buildings and any construction in Type C buildings, if width of bays is 3 feet or more but not more than 5 feet..........	144	14	14	90	10	10	80	10	10	See Notes 2 and 3

Open joist, with combustible floor planks or joists	80	10	8	80	10	8	70	10	7	See Note 4
Sheathed joists, with combustible floor planks or joists, sheathing of gypsum or cement plaster on metal lath	..	..	..	100	12	12	80	10	10	
Sheathed joists, with combustible floor planks or joists, incombustible sheathing or sheathing of plaster-board at least ½ inch thick or the equal thereof, or of plaster on wood lath, in good repair.......	168	14	14	80	10	10	70	10	7	
Sheathed joists, with combustible floor planks or joists, combustible sheathing ..	120	12 in base 10	12 ments 10	80	10	8	70	10	7	

Notes: 1. At least one line of sprinklers shall be placed in each bay; where one line is used it shall be placed in the center of bay.

2. The width of bays shall be the center to center distance of the supporting beams or girders.

3. There shall be at least one line of sprinklers in each bay if the depth of the beams exceeds 12 inches. Where the width of bays is less than 3 feet the spacing shall be as required for open joists.

4. The sprinkler lines shall be run at right angles to the joists and the sprinklers shall be staggered one half the distance between the sprinklers. The end sprinklers in alternate lines shall be not more than 2 feet, and on other lines not more than 4 feet from walls.

Under pitched roofs of combustible construction, where the slope is steeper than 1 foot in 3, there shall be one line of sprinklers under the peak, or two lines of sprinklers not more than 2 feet 6 inches distant from the peak. The remaining lines and the sprinklers shall be spaced according to the foregoing rules. In attic spaces, a line of sprinklers shall be placed 3½ feet or less from the intersection line of the roof with the attic floor or ceiling. Under sawtooth roofs the end sprinkler on a branch line shall be not closer than one foot nor farther than 2 feet 6 inches from the peak. The distances between sprinklers shall be measured parallel to the roof.

The distance from walls and partitions to sprinklers in any type of construction shall not exceed one half the allowable distance between sprinklers in the same direction, except as required for open joist construction.

Where beams, girders, columns, walls or partitions obstruct the spray of sprinklers, additional sprinklers shall be provided to effectively protect the obstructed area.

In vertical shafts of combustible construction, one sprinkler shall be provided for every 200 square feet of wall surface in addition to the sprinklers at the head of the shaft.

In vaults used for storage of flammable photographic, X-ray or motion picture film, one sprinkler shall be provided for every 63 cubic feet of available storage space.

All the foregoing regulations relating to the spacing of sprinklers shall apply to systems with ½ inch standard sprinkler heads. Where other sizes are deemed more practicable, the spacing thereof shall be subject to the approval of the Buildings Engineer.

Piping in Sprinkler Systems

Par. 9832. The number of closed head sprinklers of a sprinkler system in one fire area of a story, supplied by one pipe, shall be not more than shown in Table 9832T1 if the branch lines are fed at one point only.

TABLE 9832T1

Location	Class of System	Pipe Sizes in Inches										Remarks
		1	1¼	1½	2	2½	3	3½	4	5	6	
In all locations, except in special locations as noted below	A	2	3	5	10	40	no limit					See notes 1 & 3
	B	2	3	5	10	20	40	65	100	160	250	See note 2
	C	1	2	5	8	15	27	40	55	90	150	See note 1
Where sprinklers in attics are supplied from pipes which supply sprinklers under attic floor	A	2	4	7	14	50	..	..	..	..	..	See note 4
	B	2	4	7	14	28	48	..	..	..	..	

Notes: 1. Branch lines shall supply not more than 6 sprinklers on either side of a cross main.

2. Branch lines shall supply not more than 8 sprinklers on either side of a cross main.

3. Pipes connecting risers to underground mains shall be at least 4 inches in size.

4. Where a larger number of sprinklers are installed the attic shall be considered a separate fire area, and the pipe sizes shall be determined as in other locations.

Where cross mains in a closed head sprinkler system supply more than 10 branch lines fed at one point, a 2½ inch pipe shall supply not more than 16 sprinklers. Not more than 14 branch lines are permitted on either side of a feed main.

Where cross mains forming a complete loop are used in a closed head system, so that the branch lines are fed from both ends, the size of feed mains shall be not less, and the number of sprinklers in one fire area shall be not more than shown in Table 9832T2.

TABLE 9832T2

Size of Loop Cross Main in Inches	Class A System		Class B System		Class C System		Remarks
	No. of Sprinklers	Size of feed main in inches	No. of Sprinklers	Size of feed main in inches	No. of Sprinklers	Size of feed main in inches	
1	5	1½	5	1½	4	1½	The size of branch lines shall be determined from Table 9832T1
1¼	9	2	9	2	8	2	
1½	13	2½	13	2½	13	2½	
2	30	2½	22	3	18	3	
2½	80	3	40	3	27	3	
					30	3½	
3	No limit	3	65	3½	40	3½	
			72	4	55	4	
3½	No limit	..	100	4	80	5	
			130	5			
4	No limit	..	130	5	90	5	
			250	6	110	6	
5	No limit	..	..	..	150	6	

The total number of sprinklers supplied by an 8 inch feed main or riser shall not exceed 400 in one fire area.

In a thermostatically operated open head sprinkler system the number of ½-inch sprinklers supplied by a pipe shall be not more than shown in Table 9832T3.

TABLE 9832T3

Size of Pipe in Inches	Number of sprinklers	Size of Pipe in Inches	Number of sprinklers
1	1	3	27
1¼	2	3½	40
1½	5	4	55
2	8	5	90
2½	15	6	150

Buildings, stair shafts or towers having slatted floors, or large unprotected floor openings without approved fire-stops, shall be treated as one story with reference to the pipe sizes and the feed main shall be of sufficient size to accommodate the number of sprinklers called for.

Where the pipes are of unusual length or have a large number of bends, the size of the pipes shall be increased to compensate for increased resistance in the pipes.

Risers supplying feed mains shall be located at the centers of the mains where possible.

One or more separate risers shall supply the sprinklers in a building or section of a building divided by fire walls, except that the sprinklers in a small section may be supplied from the riser of another section.

All piping of sprinkler systems shall be so arranged that the system may be drained. The horizontal branch pipes in a wet system shall have a pitch of at least ¼ inch to 10 feet, and in a dry-pipe system a pitch of ½ inch to 10 feet.

Pipes, except for underground piping, shall be of either wrought iron or steel, of standard weight, wherever the hydrostatic pressure does not exceed 175 pounds per square inch.

Extra strong pipe shall be used where the hydrostatic pressure exceeds 175 pounds per square inch. All underground piping shall be of cast iron, of sufficient strength to safely withstand the pressure to which it is subjected.

Wrought iron pipe shall comply with the "Standard Specifications for Welded Wrought Iron Pipe" of the American Society for Testing Materials, Serial Designation A72-39.

Steel pipe shall comply with the "Standard Specifications for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Ordinary Uses", of the American Society for Testing Materials, Serial Designation A120-36.

Cast iron pipes shall conform to the specifications of the American Water Works Association, 1908.

Risers shall be properly supported by clamps, couplings, floor plates, or hangers on the horizontal connections near the risers.

Wood screws for adjustable clip hangers shall be of a size and length which will safely support the weight of the water filled pipe. Three screws shall be used for pipes 2½ inches or larger in size.

Hangers on branch lines shall be so spaced that there will be at least one hanger for each length of pipe, with a maximum spacing of 12 feet, except that where the pipe lengths are less than 5 feet, the hangers may be spaced not to exceed 10 feet apart. However, there shall be at least one hanger between two adjacent sprinklers, and one within 30 inches of every end sprinkler. On cross mains there shall be at least one hanger between two adjacent branch lines and on feed mains at least one for each 12 feet of pipe.

Hangers shall be so located as not to obstruct the free distribution of water from the sprinklers.

Pipes located under furred ceilings shall not be supported from the furring.

All hangers and other supports shall be of a type which meets the approval of the National Board of Fire Underwriters and the Buildings Engineer.

Valves and Fittings for Sprinkler Systems

Par. 9833. Sprinkler systems shall be provided with gate valves in the water supply connections as follows:

1. One controlling all sources of water supply for each system, as defined in Paragraph 9830, except Fire Department siamese connections.

2. At least one controlling each source of water supply, except Fire Department siamese connections.

3. One on each side of a check valve, except that where a gravity tank and a pressure tank are the only source of supply, the gate valve on the system side of the check valve in the pressure tank connection may be omitted.

4. One in each connection to a yard main.

All such gate valves shall be of the outside screw and yoke or post indicator type, except that the valve required in Item 4 shall be of the post indicator type. They shall be easily accessible and so located that they will not be exposed to injury. They shall be plainly and permanently marked, indicating the section or portion controlled.

Straightway check valves shall be provided in the following locations:

1. One in each connection to a source of water supply where there are more than one source, except that no check valve is required in the connection between a fire pump and cushion tank.

2. One in the pipe connection to the Fire Department siamese connection.

3. One in the connection to the only water supply, if there is a likelihood of water circulation or where there is a Fire Department connection in the system.

The dry-pipe valve shall be located in an easily accessible place and as near as practicable to the sprinklers which it supplies. One dry-pipe valve shall control not more than 600 sprinklers, nor a system whose capacity exceeds 750 gallons. Where the number of sprinklers controlled by one dry-pipe valve exceeds 300 or the capacity of the system exceeds 375 gallons, a quick opening device shall be installed as close to the valve as possible.

One thermostatically operated valve in a closed head system shall control not more than 1,000 sprinklers. The total number of sprinklers controlled by one thermostatically operated valve in an open head system shall not exceed 75 in any case, and shall not be more than:

5 for 1½ inch valve
10 for 2 inch valve
36 for 3 inch valve
75 for 4 inch valve

In exceptional cases a 6 inch thermostatically operated valve controlling not more than 150 open sprinklers may be installed if approved by the Buildings Engineer.

Each thermostatically operated valve shall be controlled by a separate gate valve.

All fittings shall be of cast iron, or of malleable iron, approved for sprinkler systems. They shall be designed to withstand a working pressure of 175 pounds per square inch. Where the working pressure exceeds 175 pounds per square inch, extra heavy fitting shall be used.

Couplings shall not be used, except where the pipe is more than 20 feet long between fittings. Unions are permitted only on 2 inch or smaller pipe and shall be of the heavy ground joint type.

All sprinkler systems shall be provided with drains so placed that all parts of the system may be drained.

Drains shall be provided at:

The base of main risers.
Each alarm valve.
Each water motor operating the alarm gong.
Each dry pipe valve.
Each gravity and pressure tank.
Each Fire Department siamese connection.
Each story or sectional control valve.

Drains shall be equipped with controlling valves and shall discharge at a point where no water damage may result.

Drain pipes and valves shall be not less than 1½ inch in size on 4 inch or larger risers, not less than 1¼ inch in size on 2½ inch or 3½ inch risers, and not less than ¾ inch in size on smaller risers. Drains on siamese connections shall be attached between the check valve and hose coupling.

All valves, fittings, and drains shall be of a type approved by the National Board of Fire Underwriters and the Buildings Engineer.

Test Pipes and Pressure Gauges on Sprinkler Systems

Par. 9834. In wet sprinkler systems, a 1-inch test pipe with a valve, and terminating in an outlet permitting a flow equal to that of a sprinkler, shall be provided on each main riser. Such test pipe shall be attached to that uppermost pipe which is at least 1¼ inch in size.

In dry sprinkler systems, a 1-inch inspector's test pipe with a valve and composition plug shall be attached to the end of that branch line which is farthest from the dry pipe valve.

Test pipes shall also be installed to test the flow of water in the connection to the water supply, unless drains may be used for such tests. The test pipes or the drains used for tests shall be at least 2 inches in size and so installed that the controlling valves may be opened wide for a sufficient time to assure a proper test without causing any water damage. All test pipes shall visibly discharge into a drain of sufficient size.

An approved type of pressure gauge with a 4½ inch dial shall be installed at the following locations:

In the connection with the water supply, near the test pipe.

At the pressure tank.

At the air compressor.

At the air receiver.

Above and below the dry pipe valve, and thermostatically operated valve.

Above and below the alarm valve.

In each independent pipe from the air suply to dry pipe systems.

At exhaustors or accelerators.

Gauges shall have a range equal to twice the working pressure prevailing at the location of the gauge. Each connection to a gauge shall be at least ¼ inch in size and provided with a valve and a ¼ inch plugged outlet between the valve and gauge for attaching the inspector's gauge.

Water Supplies and Connections in Sprinkler Systems

Par. 9835. All sprinkler systems shall have at least one approved automatic source of water supply, such as the water supply system of Baltimore City, a gravity or pressure tank, or an automatic booster pump.

Where the water supply system of Baltimore City constitutes the only source of supply, it shall comply with the following requirements:

a. For Class A systems, the residual pressure at the nearest outside hydrant shall be such as to give a pressure of at least 15 pounds per square inch at the highest sprinkler, when the hydrant is discharging 250 gallons per minute.

b. For Class B systems, the pressure conditions shall be as required for Class A systems, when the hydrant is discharging 500 gallons per minute.

c. For Class C systems the adequacy of the suply shall be determined by the number of sprinklers and other conditions, and the results shall meet with the approval of the Buildings Engineer.

The capacity of gravity and pressure tanks and the rating of booster pumps shall be as required in Paragraph 9836.

All pipe connections to the water supply shall be of at least the same size as that of the largest riser. Connections to all water supplies shall be at the lower end of the main riser, except that where gravity or pressure tanks or both form the only water supply, the connection may be made at the top of such riser. Where a pressure tank and gravity tank discharge to a common riser, the discharge pipe of the gravity tank shall connect into the riser at least 40 feet below the bottom of the pressure tank to avoid airlocks.

No domestic water supply service connection will be allowed to any sprinkler riser.

All sprinkler systems shall be provided with a Standard Fire Department siamese connection. Where such systems are in buildings facing two streets, there shall be at least one such connection on each front. Buildings facing more than 2 streets and having less than 300 feet total frontage shall have at least two such hose connections. Buildings with a total frontage of more than 300 feet shall have at least one such hose connection on each front.

Fire Department siamese connections shall be of such size and construction as is required by the Board of Fire Commissioners. Such connections shall have a check valve and be drained as required in Paragraph 9833. Fire Department siamese connections shall be attached to sprinkler systems at points as follows:

In wet systems with one riser, on the system side of the main shut-off valve, alarm valve or supply check valve.

In dry systems with one riser, between the dry-pipe valve and the shut-off valve.

In systems with two or more risers, on the system side of all valves controlling other supplies, but on the supply side of all riser control valves.

The Fire Department siamese connections shall be provided with a 2½ inch National Standard female thread. The couplings shall be of bronze and provided with caps. Each hose connection shall be designated by one inch letters, cast in the fitting if possible, for the use it is intended.

Where first aid hose connections for the use of occupants are attached to a wet sprinkler system, they shall conform to the following requirements:

Hose outlets shall be one inch in size.

Nozzle shall be not larger than one-half inch.

Sprinkler pipe to which connection is made shall be not less than two-and-one-half inch in size.

No hose shall be connected to dry pipe systems.

No water supply from a polluted source shall be used together with the water supply system of Baltimore City.

Gravity and Pressure Tanks, and Booster Pumps for Sprinkler Systems

Par. 9836. Gravity tanks forming the water supply for sprinkler systems shall be as follows:

a. For Class A or Class B systems, their capacity shall be not less than 5000 gallons with their bottom not less than 35 feet above the highest sprinkler, except that where such tanks form the secondary supply in Class B systems, their bottom may be not less than 20 feet above the highest sprinkler.

b. For Class C systems their capacity and elevation shall be determined by the number of sprinklers and other conditions, and shall meet with the approval of the Buildings Engineer.

Pressure tanks shall have a minimum water capacity as follows:

a. For Class A systems, 2000 gallons.

b. For Class B systems, 3000 gallons.

c. For Class C systems, an amount depending on the number of sprinklers and other conditions, and meeting with the approval of the Buildings Engineer.

The bottom of pressure tanks shall be above the highest sprinkler, except where otherwise permitted by the Buildings Engineer. They shall be kept filled with water up to two-thirds of their capacity. An air pressure of at least 75 pounds per square inch by the gauge shall be maintained in such tank except that in tanks which are below the highest sprinkler the air pressure shall be at least 75 pounds per square inch plus three times the pressure caused by the water column in the system above the tank bottom.

All tanks shall be filled through a pipe at least 2 inches in size, which pipe shall not be a part of the sprinkler piping. The pipe shall discharge above the highest water level of pressure tanks or at the top of gravity tanks, except that in gravity tanks supported on a structure independent of the building, it may discharge through a by-pass around the check valve into the tank discharge. The rate of filling shall be at least 65 gallons per minute. Booster pumps, if required in the system, shall not be used for filling tanks.

Gravity tanks shall be provided with an overflow one size larger than the pipe used for filling the tank. The overflow shall discharge into a place where no damage may result from the water. All gravity and pressure tanks shall have an emergency drain with an appropriate valve.

All tanks shall be equipped with water level gauges, visible from the outside, of a type approved by the National Board of Fire Underwriters and the Buildings Engineer. On pressure tanks, a metal plate, bearing an easily observed and raised arrow with the lettering "2/3 capacity line" shall be fastened to the tank behind the gauge glass in a position such that the arrow will be at the water level when the tank is two-thirds full.

Booster pumps shall be automatic and shall be able to furnish at least the following volumes, maintaining a pressure of at least 15 pounds per square inch at the highest sprinkler:

a. In Class A systems 250 gallons per minute.

b. In Class B systems 500 gallons per minute.

c. In Class C systems, a volume depending on the number of sprinklers and other conditions, and meeting with the approval of the Buildings Engineer.

d. Where supplying hydrants on private property as well as sprinklers, the above quantities shall be increased by at least 250 gallons.

The supply to booster pumps shall be under the pressure from the water supply system of Baltimore City.

All booster pumps shall be located at or near the ground level on a masonry base at least 12 inches above the floor and so located that the pump will be easily accessible from all sides. The connection from an electrically driven booster pump to the electric feed line shall be made ahead of the main service switch unless a separate feeder from the electric power station is installed.

All gravity and pressure tanks, booster pumps, and similar equipment, shall be of a type approved by the National Board of Fire Underwriters and the Buildings Engineer. All tanks shall also conform to the requirements of Chapter 97 of this Code as to material, construction, supports and workmanship.

Air Supply for Dry-Pipe Sprinkler Systems

Par. 9837. The manufacturer of the dry-pipe valve, used in sprinkler systems, shall furnish instructions stating the most effective air pressure to be carried in the system. The permitted rate of leakage shall be such that there will be no necessity to replace air in the system more than once a week.

The air compressors shall be able to restore the operating air pressure, plus 25 per cent, in 30 minutes.

The connection from the air compressor shall enter the system above the priming water level of the dry-pipe valve and shall be provided with a check valve and a shut-off valve, the latter located between air compressor and check valve.

Relief valves set to relieve pressure 5 pounds in excess of the operating pressure, shall be installed between the compressor and the shut-off valve.

The air supply for the compressor shall be taken from a room containing dry air or passed through a drying chamber.

Protection of Sprinkler Equipment

Par. 9838. All parts of a sprinkler system shall be protected against mechanical injury and corrosion by moisture, fumes and chemicals. Water stored in the system shall be protected against freezing.

Whenever the sprinkler piping is exposed to moisture, all parts shall be painted with two coats of red lead and linseed oil. Where the piping is exposed to chemical fumes it shall be protected with two coats of chemical resisting paint.

Where sprinkler heads are exposed to moisture or chemical fumes they shall be of a type which will resist the action of such moisture or fumes. Sprinkler heads shall never be painted after installation.

Concealed piping and hangers shall be painted with two corrosion resisting coats of paint.

Where pipes pass through or are embedded in cinder concrete floors or partitions, they shall be protected by metal sleeves, or ducts.

A dry-pipe system shall be used in such locations where sprinklers are in danger of freezing. Dry-pipe valves shall be effectively protected against freezing.

Where underground or outside supply piping and valves are exposed to frost, they shall be well protected. When enclosures serve as the protection, they shall be either heated or filled with insulating material. Where such enclosures are heated, they shall provide at least 1 foot of clear space around the pipe or valve.

Drainpipes, drips and test pipes shall be so installed as not to expose any part of the system to freezing.

Where the discharge, fill, overflow or heating pipes of a tank are exposed to freezing, they shall be protected as follows, except as permitted below:

a. Three layers of one inch hairfelt, laid on one wrapping of roofing paper and covered by 8 ounce canvas. Pipe and canvas shall have 2 coats of water-proof paint.

b. Wooden boxes consisting of one inner layer separated by 2 inches from a double outside layer having roofing paper between the layers. All layers shall be made of at least ⅝ inch of matched wooden planks.

c. Any other method equal in protection to that of either of the preceding methods.

Where a penstock type of discharge is used from tanks, frost protection may be omitted, provided the penstock is at least 36 inches in diameter and the water therein is heated.

The temperature of the water in tanks exposed to freezing shall be maintained at a minimum of 40 degrees Fahrenheit by a gravity circulating heating system, except that steam coils may be used in suction tanks not over 25 feet high with their bottoms at the ground level.

Sprinkler Alarms and Thermostats for Sprinkler Systems

Par. 9839. All automatic sprinkler systems shall be provided with an automatic alarm device so constructed that it will detect the flow of water through one sprinkler. In wet-pipe systems, this device shall consist of an approved alarm check valve, and in dry-pipe systems, of an approved alarm attachment to the dry-pipe valve. Thermostatically operated dry-pipe systems shall be equipped with an electric alarm device actuated indepedently of the water flow.

Such devices shall be connected either to a motor operated mechanical gong, or to an electric gong, so located that it will be audible to the operator or watchman in charge, or to the passers-by outside. Gongs placed outside of the buildings shall be weatherproof.

A shut-off valve shall be installed in the connection to the water motor operated alarm devices or pressure contactor. The valve shall be of a type which indicates whether it is open or closed.

Where an alarm valve is used in a system with variable water pressure, a retarding device shall be installed between the alarm valve and the alarm attachment.

Water-motor-operated alarm devices shall be located as close as possible to the alarm valve or other alarm attachment, and the device shall be not more than 20 feet above the alarm valve or other alarm attachment. The piping connecting such device to the alarm valve or other alarm attachment shall be of brass or galvanized iron, at least ¾ inch in size, and shall be at least 1 inch in size where its length is more than 75 feet, or where the pressure is low.

Where alarm devices are attached to a dry-pipe valve, the latter shall be equipped with a test connection provided with a control valve and drain.

Sprinkler alarms shall be identified by conspicuous, durable signs, with the following wording: "Sprinkler Alarm-Call Fire Department When Alarm Sounds".

The spacing of thermostats shall be in accordance with their listing by the Underwriters' Laboratories.

SECTION 985

WATER CURTAINS

General Requirements for Water Curtains

Par. 9850. Water curtains shall be divided into exterior water curtains and interior water curtains.

Water Supply for Water Curtains

Par. 9851. All types of water curtains shall have at least one automatic water supply such as the water supply system of Baltimore City, automatic fire pump, or gravity or pressure tank.

Pressure tanks supplying automatic sprinkler systems shall not be used as a water supply. Water supplies serving water curtains and other fire extinguishing appliances also shall have a sufficient capacity to serve both systems when operating simultaneously.

Water supplies shall have a sufficient capacity to supply all sprinklers designed to be operated at one time and maintain at least a pressure of 10 pounds per square inch at the top of the risers for at least 60 minutes while the system is in operation.

Tanks and pumps shall conform in all respects, except that of capacity, to the requirements for tanks and pumps in sprinkler systems in Section 983. Their capacity shall be such as to satisfy the requirement for water supply in Paragraph 9851. On the discharge pipe of tanks only one gate valve located between the check valve and tank is required.

Where a pressure tank is used as a water supply, the air compressor supplying such tank and the pressure to be maintained shall be as required for sprinkler systems.

Where a Fire Department siamese connection is attached to a water curtain, it shall be so located as to be safe from the exposing fire. Such connection shall be equipped with a check valve. Fire Department hose connections shall conform in all requirements to those for sprinkler systems.

Arrangement of Exterior Water Curtains

Par. 9852. Where an exterior water curtain is divided into groups of open sprinklers, each controlled by a separate operating valve, these groups shall be divided by vertical lines.

One valve shall not operate open sprinklers on more than one side of a building. Where sprinklers are located on two adjoining sides of a building, the end lines at the same levels shall be connected and check valves so installed that one sprinkler around the corner will operate when any one of the operating valves is opened. The pipe between such check valves shall be so arranged as to drain properly.

Where a water curtain is installed to protect a building against more than one distinct and separate exposure, the water curtain shall be subdivided and manually operated control valves installed for each group protecting a separate exposure.

Where over 6 horizontal lines of sprinklers are used, the system shall be divided into horizontal groups of 6 lines or less. Each group shall have a separate riser.

All piping shall be so arranged and pitched that the whole system may be drained.

All exterior water curtains shall be provided with a Standard Fire Department siamese hose connection.

Sprinklers for Exterior Water Curtains

Par. 9853. Where window openings are protected by water curtains, one sprinkler shall be placed at the center near the top of every window not over 5 feet wide. Where windows are over 5 feet wide or where mullions interfere with the free flow from the sprinklers, two or more sprinklers shall be installed. All sprinklers in a window shall be so located that the water discharged will thoroughly wet the upper part of the window and, by running down, wet the entire window.

Where cornices, side walls or ridge poles are protected by water curtains, the sprinklers shall be not over six feet apart on the line.

All sprinklers for exterior water curtains shall have smooth bore tapering orifices. They shall be ⅜ inch in diameter where one line of sprinklers is used in windows, except as permitted below. Where more than one line of sprinklers are used for window protection, the sizes of orifices shall be as shown in Table 9853T.

TABLE 9853T

	2 lines	3 lines	4 lines	5 lines	6 lines
Top line ..	⅜ in.	⅜ in.	⅜ in.	⅜ in.	⅜ in.
Next below	5/16 “	5/16 “	⅜ “	⅜ “	⅜ “
Next below	....	¼ “	5/16 “	5/16 “	5/16 “
Next below	....	....	¼ “	5/16 “	5/16 “
Next below	....	....	....	¼ “	¼ “
Next below	....	....	....	....	¼ “

Where windows are 3 feet or less in width, the orifice may be of one size less than that shown in Table 9853T, but not less than ¼ inch.

Orifices on sprinklers protecting cornices, side walls, or ridge poles shall be at least ⅜ inch in diameter.

The size of the orifice shall be clearly marked on the outside of the sprinkler.

All sprinklers shall be of a type approved by the National Board of Fire Underwriters and the Buildings Engineer.

Piping and Valves for Exterior Water Curtains

Par. 9854. The maximum number of sprinklers of an exterior water curtain on a branch line supplied by a riser on one end shall be as shown in Table 9854T1, with a maximum of six for pipes larger than 1½ inches:

TABLE 9854T1

Size of Orifice	Pipe Sizes			
	¾ in.	1 in.	1¼ in.	1½ in.
⅜ in.	1	2	4	6
5/16 “	1	3	6	6
¼ “	1	5	6	6

On branch lines supplied by a riser on both ends, the number of sprinklers shall be not more than twice the number shown in Table 9854T1, but not more than twelve.

Mains and risers supplying branch lines from one end of such lines shall supply no more than the number of sprinklers shown in Table 9854T2.

TABLE 9854T2

Size of Pipe	No. of Sprinklers
1½	6
2	10
2½	20
3	36
3½	55
4	72

Mains and risers supplying branch lines from both ends of such lines shall be of the same size as shown in the Table 9854T2 counting the sprinklers to the center of each branch line. Where in such case there is an odd number of sprinklers on a branch line, the center sprinkler may be neglected in figuring the size of the risers. The size of mains supplying two or more risers shall be based on the total number of sprinklers supplied by such risers.

Where water curtains are connected to cross mains of an inside automatic sprinkler system the connection shall be in the first story, and the mains and risers shall be so sized as if all sprinklers were one-half inch in size and as if all sprinklers of the water curtain and of the largest fire area in the inside sprinkler system were operating at the same time.

The size of a feed main supplying more than one riser shall never be less than that required to equal the capacity of the two largest risers which it supplies.

Where the length of a feed main plus the length of the largest riser up to the first branch line exceeds 25 feet, such feed main shall be a size larger than that shown in Table 9854T2.

Pipes, except for underground piping, shall be of either wrought iron or steel. Where the hydrostatic pressure exceeds 175 pounds per square inch, such pipes shall be of at least extra strong weight. All underground piping shall be of cast iron, of sufficient strength to safely withstand the pressure to which it is subjected.

All piping, except cast iron pipes, shall be galvanized or otherwise protected against corrosion in a careful and workmanlike manner. Wrought iron pipe shall comply with the "Standard Specifications for Welded Wrought Iron Pipe" of the American Society for Testing Materials, Serial Designation A72-38. Steel pipe shall comply with the "Standard Specifications for Black and Hot-Dipped Zinc Coated (Galvanized) Welded and Seamless Steel Pipe for Ordinary Uses", of the American Society for Testing Materials, Serial Designation A120-36.

Cast iron pipe and fittings shall conform to the specifications of the American Water Works Association, 1908.

Pipes shall be securely supported in a manner fully equal to that required for automatic sprinklers. All pipes shall be adequately protected against freezing as required for sprinkler systems where such pipes are filled with water at all times.

Fittings shall be of the extra heavy type for working pressure over 175 pounds per square inch. Fittings need not be galvanized.

Each riser supplying a separate group of branch lines shall be provided with a separate shut-off valve, except that where two end risers supply such a group they shall be connected at the bottom and provided with one shut-off valve. Riser valves shall be so located as to be easily accessible, preferable in the first story.

Each thermostatically operated valve shall be provided with a controlling gate valve.

Where a water curtain is connected to a water supply serving also other fire extinguishing systems, such connection shall be equipped with a separate shut-off valve.

All valves shall be designated with letters at least ½ inch high indicating their function.

All shut-off valves shall be of a type which will clearly indicate whether the valve is open or shut.

At all dead ends of horizontal feed pipes, a tee instead of an elbow shall be used and a piece of pipe 6 inches long, with a brass plug in the end, shall be screwed into the tee to form a dirt pocket.

Plugged outlets for gauge connections shall be attached to the top of each riser and just below the shut-off valve of each riser. Such outlets shall be piped into the building.

Drains and drip pipes shall be at least one inch in size.

All valves and fittings shall be of a type approved by the National Board of Fire Underwriters and the Buildings Engineer.

Controls for Exterior Water Curtains

Par. 9855. Every exterior water curtain shall be manually controlled. In addition to the manual controls, thermostatically operated control valves shall be permitted if they do not in any way affect the operation of the manual controls.

Each water curtain shall be equipped with an electric alarm, actuated by a thermostatic system independent of the flow of water in the system. The gong of this alram shall be so located that it will be audible to the operator or watchman in charge or to the occupants of the building.

All alarm devices shall of a type approved by the National Board of Fire Underwriters and the Buildings Engineer.

The distance between thermostats of the pneumatic rate-of-rise type, located on one horizontal line, shall not exceed 30 feet on buildings less than three stories in height and not exceed 40 feet on buildings three or more stories in height. Spacing of other types of thermostats shall be in accordance with their listings by the Underwriters' Laboratories. The horizontal distance from the thermostats to the end of the walls or structures shall never be more than half of the permissible distance between thermostats.

There shall be at least one line of thermostats for each eight stories on buildings more than eight stories in height, with the thermostats staggered. One line of thermostats shall be located in any case close up under the cornice, eave or on the outer face of the parapet.

The air piping between the thermostats and control valves shall be protected against mechanical injury.

All thermostats shall be of a type approved by the National Board of Fire Underwriters and the Buildings Engineer.

Arrangement and Controls of Interior Water Curtains

Par. 9856. All interior water curtains shall be automatic in their operation.

Each unit of interior water curtains shall be so arranged as to completely protect that opening, or to cut off that hazardous area for which it is intended.

Each unit shall be controlled by a separate thermostatically operated valve located as close to the exposure it protects as is practical and consistent with safety. Each such valve shall be controlled by a separate gate valve which shall be located as far as practical from the protected exposure.

Sprinklers for Interior Water Curtains

Par. 9857. All sprinklers for an interior water curtain shall be of a type approved by the National Board of Fire Underwriters and the Buildings Engineer, and shall have smooth bore tapering orifices not less than three-eights inch in diameter. They shall be spaced not more than 5 feet apart.

Piping for Interior Water Curtains

Par. 9858. The quality of all pipe and fittings and the sizes required for various number of sprinklers of interior water curtains shall be the same as required for exterior water curtains in Paragraph 9854.

SECTION 986

SPECIAL FIRE EXTINGUISHING SYSTEMS

Scope of Special Fire Extinguishing Systems

Par. 9860. Special fire extinguishing systems shall include carbon dioxide, deluge and other fire extinguishing systems for purposes not specifically regulated in this Code.

Carbon Dioxide Systems

Par. 9861. Carbon dioxide systems shall be designed, constructed and installed only by persons experienced in such work, and any work or operation done or performed in connection therewith shall be subject to the approval of the Buildings Engineer in accordance with the following requirements:

a. No automatic carbon dioxide system shall be installed in any room for public or private assembly occupancy or other rooms where 100 or more persons may assemble at any one time. In museums, art galleries, libraries and other similar buildings where less than 100 but more than 25 persons may assemble at any one time, such carbon dioxide systems shall be so arranged that a small amount, but never more than one cylinder of carbon dioxide gas shall be released one minute before the full charge.

b. Manually controlled carbon dioxide systems, when installed in areas where 100 or more persons may assemble, shall have their controls located as remote as possible from the nearest exit doorway and equipped with an automatic alarm which will sound three minutes before the gas can be turned on.

c. Local carbon dioxide systems controlled by the occupants of the room in which they are located shall be permitted without restriction if not more than two cylinders at a time can be released.

Deluge Systems

Par. 9862. A deluge system is a sprinkler system controlled by an approved automatic valve operated by an approved thermostatic system as required in Paragraph 9862.

Thermostats or other actuating devices of the bulb type pneumatic rate of rise shall be spaced not more than 50 feet apart and not more than 25 feet from walls or partitions. Spacing of other actuating devices or thermostats shall be in accordance with their listing by the Underwriters' Laboratories. Not more than 1,000 closed head sprinklers nor more than 75 open head sprinklers shall be controlled by any one thermostatically operated valve. The spacing of sprinkler heads shall not exceed 6 feet in either direction. A gate valve shall control each thermostatically operated valve and shall be located as far away as practicable from the hazard protected.

In case of open head systems, the thermostatically operated valve shall be placed as close as possible to the hazard protected consistent with safety. In all other respects, Deluge Systems shall conform to the respective applicable requirements for sprinkler systems in Chapter 98.

SECTION 987

PORTABLE FIRE EXTINGUISHERS

General Regulations for Portable Fire Extinguishers

Par. 9870. The location of portable fire extinguishers shall be shown on drawings or in specifications for every new building or existing building and such drawings or specifications shall be approved before such fire extinguishers are installed. Such drawings or specifications shall show or specify the capacity, type and chemical contents, and the means of support of all extinguishers.

All such extinguishers shall be of a type, capacity, and construction that meets with the approval of the National Board of Fire Underwriters and the Buildings Engineer.

Classification of Portable Fire Extinguishers

Par. 9871. Portable fire extinguishers are devices which are entirely self-contained, requiring no fixed piping, nor connection to a water supply, and which can be transported and operated by one person.

Portable fire extinguishers shall be classified for the purpose of this Code according to the nature of the fires which they are designed to extinguish, as follows:

Class A extinguishers. This type includes all extinguishers designed for extinguishing incipient fires of ordinary combustible materials where the quenching and cooling effect of water, or solutions containing a large percentage of water, is of first importance.

Class B extinguishers. This type includes all extinguishers designed for extinguishing incipient fires of small quantities of flammable liquids and greases, where a blanketing effect is essential.

Class C extinguishers. This type includes all extinguishers designed for extinguishing incipient fires of electrical equipment, where the use of a non-conducting extinguishing agent is essential.

Extinguishers suitable for more than one kind of fire will be designated with a combination of letters; thus, a Class AB appliance is capable of extinguishing a fire of ordinary combustible materials and also a fire of inflammable liquids.

The results of tests conducted by the Underwriters' Laboratories shall determine the suitability of various types of extinguishers, or chemicals for a certain kind of fire.

Location of Portable Fire Extinguishers

Par. 9872. All portable fire extinguishers shall be located at conspicuous and easily accessible places. Where necessary, conspicuous signs shall indicate their locations.

Where pails are used in connection with casks and bucket tanks, such pails shall be hung on hangers or set on shelves so that their upper rims will not be more than 5 feet nor less than 2 feet from the floor.

Tank type portable fire extinguishers of less than 5 gallons capacity shall be hung on hangers or set on shelves or brackets so that the top of the extinguisher is not more than 5 feet above the floor. Extinguishers of a capacity of 5 gallons or more shall be similarly supported but their top shall not be higher than $3\frac{1}{2}$ feet from the floor.

Portable extinguishers which require a hand truck for their transportation shall not be removed from such trucks.

Where portable fire extinguishers, containing solutions liable to freeze, are located in structures where the temperature may drop below 40 degrees F., and the addition of anti-freezing chemicals will impair the proper operation, such extinguishers shall be located in heated closets.

SECTION 988

INSPECTION AND TESTS FOR FIRE EXTINGUISHING APPLIANCES

General Regulations for Tests of Fire Extinguishing Appliances

Par. 9880. All inspections and tests required in Section 988 of this Code shall be made under the supervision of the Buildings Engineer and the Chief Engineer of the Fire Department of Baltimore City, and the owner of the property protected or to be protected by the particular fire extinguishing appliances being inspected or tested shall pay any and all costs and expenses incurred or which may be incurred in connection with any such inspections or tests.

Inspection and Tests for Standpipe Systems

Par. 9881. Every standpipe system shall be inspected and tested at the completion of the installation thereof by qualified persons authorized by the person, firm or corporation who is responsible for the installation of any such system to make such inspection and tests. Special attention shall be given to the hose stations of such systems to see that the hose is in the proper position on the rack provided therefor, and such hose is in operating condition. When testing the system, it shall be filled with water under a pressure which is 25 per cent higher than the highest normal operating pressure, for a duration of two hours. The installation shall be acceptable if no leakage occurs during such a test.

Inspection and Tests for Foam Systems

Par. 9882. Every foam system shall be inspected at the completion of the installation thereof by the manufacturer of such system, or his authorized agent, and such manufacturer or his authorized agent shall make a full and complete report of his inspection of such system to the Buildings Engineer. A full capacity test of the foam producing materials used in such system shall be made at the time when the aforementioned inspection is made.

Inspection and Tests for Sprinkler Systems and Water Curtains

Par. 9883. Every sprinkler system shall be inspected at the completion of the installation thereof by qualified persons authorized to make such inspection by the person, firm or corporation who is responsible for the installation of any such system.

All closed head sprinkler systems shall be subjected to a hydrostatic pressure test upon the completion of the installation thereof. The system shall be filled with water for two hours under a pressure which is 50 pounds per square inch higher than the highest operating pressure, but such test pressure shall be at least 200 pounds per square inch.

Piping between the check valve and the outside connection of a Fire Department siamese connection shall be included in such tests.

In addition to the hydrostatic test, the dry pipes in a pneumatically operated system shall be tested under an air pressure of 40 pounds per square inch for 24 hours. The installation shall be acceptable if the loss of pressure in 24 hours is not more than 1½ pounds per square inch.

Such portions of the piping of an open head system which are normally filled with water shall be subjected to a hydrostatic pressure test upon the completion of the installation thereof.

SECTION 989

MAINTENANCE AND OPERATION OF FIRE EXTINGUISHING APPLIANCES

General Regulations for Maintenance and Operation of Fire Extinguishing Appliances

Par. 9890. All fire extinguishing appliances shall be maintained in good repair and in such a condition that their faultless operation will be insured in case of fire.

Where metal parts of any such appliances are painted for protection against corosion, the painting shall be renewed whenever it shows any sign of deterioration or scaling.

All fire extinguishing appliances and equipment shall be maintained and operated in accordance with the requirements of the Fire Department.

All portable fire extinguishers shall be maintained under the supervision of the Fire Department.

Maintenance of Standpipe Systems

Par. 9891. The hose at the hose stations of standpipe systems shall be removed at intervals and new gaskets installed in the couplings at the hose valves and the nozzles. The hose valves shall be kept tight.

The valves in the connections to the water supplies shall be kept in an open position and sealed at all times.

Tanks in standpipe systems shall be kept filled and the proper pressure shall be maintained at all times in all such tanks.

A diagram shall be prepared of every standpipe system having a fire pump or more than 3 risers, and this diagram shall be posted at a conspicuous place within the building served by such system, as required by the Board of Fire Commissioners. This diagram shall clearly show each riser valve, pump and all hose connections.

Maintenance of Foam Systems

Par. 9892. An extra supply of foam producing materials for recharging a foam system shall be kept on the premises where such systems are installed.

The owner of any property protected by a foam system shall provide a sufficient number of trained men who shall be available at all times for the proper operation of such foam system. Where portable equipment which is part of a foam system has to be transported in case of fire, proper means of transportation to move such equipment shall be provided by the owner of the property protected by any such foam system, and such means of transportation shall be immediately available at all times.

Maintenance of Sprinkler Systems and Water Curtains

Par. 9893. The valves in the connections of sprinkler systems and water curtains to the water supplies and the riser control valves shall be kept in an open position and sealed at all times.

In sprinkler systems and water curtains, control valves in the connections to the water motors and to the pressure contactors of alarm devices shall be locked or sealed in open position.

Tanks in sprinkler systems and water curtains shall be kept filled and the proper pressure shall be maintained at all times in all such tanks.

The necessary air-pressure shall be maintained at all times in pneumatically operated dry pipe sprinkler systems.

Booster pumps in or for sprinkler systems or water curtains shall be supervised 24 hours a day,. so that the requisite pressure in any such sysetm or curtain is constantly maintained. This supervision shall be done locally by a competent supervisor or by a supervisory attachment connected to the central station of a fire alarm company, and which central station is directly connected to the headquarters of the Fire Department of Baltimore City.

A reserve supply of at least 12 sprinkler heads for the particular sprinkler system or water curtain which has been installed on any particular premises shall be kept on such premises at all times, and all damaged or fused sprinkler heads shall be promptly replaced.

Section 3. *And be it further ordained,* That nothing contained in this Ordinance shall be taken or construed to repeal, affect, modify, change or amend, in any manner whatsoever, any provisions of Ordinance No. 1251, approved April 10, 1931, regulating the installation of plumbing and drain laying, or any of the rules or regulations formulated, made, adopted or promulgated in accordance with the provisions of said Ordinance No. 1251, approved April 10, 1931, unless such rules or regulations are inconsistent with the provisions of this Ordinance.

Section 4. *And be it further ordained,* That nothing contained in this Ordinance shall be taken or construed to repeal, affect, modify, change or amend, in any manner whatsoever, any provisions of Ordinance No. 1296, approved May 13, 1931, or any amendments thereto, pertaining to the control of the discharge of smoke and other products of combustion, or any of the rules or regulations formulated, made, adopted or promulgated in accordance with the provisions of said Ordinance No. 1296, approved May 13, 1931, or any amendments thereto, and that nothing contained in this Ordinance shall be taken or construed to apply to any of the matters or things over which the Division of Smoke Control in the Bureau of Mechanical-Electrical Service or the Advisory and Appeal Board, as created and established by Ordinance No. 1296, approved May 13, 1931, and all amendments thereto, jointly or severally, now have jurisdiction, power or authority.

Section 5. *And be it further ordained,* That any and all laws, ordinances or resolutions and any and all parts of any and all laws, ordinances or resolutions in force in the City of Baltimore inconsistent with the provisions of this Ordinance are hereby repealed to the extent of any such inconsistency.

Section 6. *And be it further ordained,* That in case it be judicially determined that any word, phrase, clause, item, sentence, paragraph, section, chapter or part in or of this Ordinance, or the application thereof to any person or circumstance, is invalid, the remaining provisions and the application of such provisions to other persons or circumstances shall not be affected thereby, the Mayor and City Council hereby declaring that they would have ordained the remaining provisions of this Ordinance without the word, phrase, clause, item, sentence, paragraph, chapter, section or part, or the application thereof, so held invalid.

Section 7. *And be it further ordained,* That any and all work or operations to be done or performed under a permit which has been issued by the Buildings Engineer before the effective date of this Ordinance shall be completed in accordance with the provisions of any and all laws, ordinances and regulations in force at the time any such permit was issued. Provided, however, that upon the filing of a proper application as required by this Ordinance, the Buildings Engineer may issue a permit to do or perform any and all such work or operations in accordance with the provisions of this Ordinance.

Any and all work or operations to be done or performed under a permit which may be issued by the Buildings Engineer upon an application for a permit, which said application was filed before the effective date of this Ordinance, shall be completed in accordance with the provisions of any and all laws, ordinances and regulations in force at the time when such application was filed with the Buildings Engineer. Provided, however, that upon the filing of a proper application as required by this Ordinance, the Buildings Engineer may issue a permit to do or perform any and all such work or operations in accordance with the provisions of this Ordinance.

Any and all appeals from any decisions of the Buildings Engineer pending before a Board of Arbitration or any court, at the time of the passage of this Ordinance, shall not be affected by this Ordinance, but such appeals shall be proceeded with under existing laws and ordinances as if this Ordinance had not been passed.

Section 8. *And be it further ordained,* That the repeal by this Ordinance of any provisions of law shall not revive any law heretofore repealed or superseded, nor shall any such repeal affect any act done, liability incurred, or any right accrued or vested, or affect, or abate, or prevent any right or penalty or punishment of any offense under the authority of such repealed laws.

Section 9. *And be it further ordained,* That this Ordinance shall be in full force and effect from the date of its passage, except that the Buildings Engineer shall, within one year from the date of the passage of this Ordinance, provide all forms and equipment and make any and all changes in the organization of the Bureau of Buildings that may be necessary to properly administer the provisions of this Ordinance as set forth herein.

Approved October 31, 1941.

HOWARD W. JACKSON, *Mayor.*

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